THE TECHNOLOGICAL STATE IN INDONESIA

The co-constitution of high technology and authoritarian politics

Sulfikar Amir

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The Technological State in Indonesia

Using a historical sociological approach, this book illustrates the formation of the technological state in Indonesia during the New Order period (1966–98). It explores the nexus between power, high technology, development, and authoritarianism situated in the Southeast Asian context.

The book discusses how the New Order regime shifted from the developmental state to the technological state, which was characterized by a desire for technological supremacy. The process resulted in the establishment of a host of technological institutions and the undertaking of large-scale high-tech programs. Shedding light on the political dimension of socio-technological transformation, this book looks at the relationship between authoritarian politics and high technology development, and examines how effectively technology serves to sustain legitimacy of an authoritarian power.

It explores the multiple features of the Indonesian technological state, covering the ideology of development, the politics of technocracy, the institutional structure, and the material and symbolic embodiments of high technology, and goes on to discuss the impact of globalization on the technological state. The book is an important contribution to studies on Southeast Asian Politics, Development, and Science, Technology, and Society.

Sulfikar Amir is an Assistant Professor in the Division of Sociology at Nanyang Technological University, Singapore. His research interests include science and technology studies, technological politics, development, nationalism, globalization, the sociology of risk, and resilience studies.

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For my father who taught me the meaning of learning and my mother for her endless prayers.

PANCASILA

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Preface

I grew up in Indonesia when the New Order regime was growing in power. Changes were taking place almost everywhere, including my hometown, where economic development unfolded quite impressively. What fascinated me, my family, and many other people I knew was how the New Order government built the aircraft industry in Bandung. High technology was celebrated and being an engineer became a very popular dream for my generation's youth. This book is about what happened in Indonesia during the New Order time. Plenty of works have been published on Indonesia's New Order that shed light on a broad range of issues. Scholars on Indonesian studies attempted to explain the nature and character of the New Order authoritarian regime using conceptual theories in social sciences. Some of these works strongly criticized what the New Order did during its reign; others praised the achievements of the regime in transforming Indonesian society. This book seeks to give an alternative account of the New Order Indonesia by emphasizing technology as the main feature of developmental change. As I am intrigued by how ideas shape our material world, I wrote this book to show how intellectual ideas influenced Indonesian politics and steered modernization and industrial development during the most important episode in Indonesia's contemporary history.

This book was a long time in the making. During the process, I received generous help, insightful comments, and endless support from so many people and institutions. The book started as a doctoral dissertation at the Department of Science and Technology Studies, Rensselaer Polytechnic Institute, the place where I had an intellectual enlightenment. I am deeply indebted to my chair, Langdon Winner, who never ceased to support me. His critical mind greatly shaped my intellectual orientation. I am very grateful to David Hess who encouraged me to come to Rensselaer. If it were not for David, I would have never become a science, technology, and society (STS) academic. I am thankful to Kim Fortun who continuously provided motivation and inspiration to help me finish my dissertation. Faculty members at Rensselaer's STS deserve my gratitude for making my sojourn at Renssealer an exciting learning experience: Atsushi Akera, Steve Breyman, Nancy Campbell, Ron Eglash, and Sal Restivo. In working on this book, I collected a large amount of information from individuals who played central roles in the making of development and technology

policy during the New Order period. For this, I want to give special thanks to B.J. Habibie for providing me with two interviews. My thanks also go to a number of New Order technocrats, most notably Ali Wardhana, Emil Salim, Giri Suseno Hadihardjono, Muhammad Sadli, Rahardi Ramelan, and Soedradjat Djiwandono. My research at the Indonesian Aircraft Industry in Bandung was made possible by support from senior engineers at the company whom I am unable to name one by one. However, a few of them should be mentioned here: S. Paramajuda, Jusman Syafii Djamal, Alex Supelli, Bambang Pamungkas, Said D. Jenie, Hari Laksono, Budi Santoso, Ilham Habibie, Andi Alisjahbana, and Lili Irahali.

Much of the concept and content presented in this book has changed from the original version of my dissertation. It resulted from two years of research during which I traveled back and forth from Singapore to Jakarta and Bandung. During my fieldwork, I was warmly welcome by the Ministry of Research and Technology (RISTEK) and the Agency for the Assessment and Application of Technology (BPPT). The officials at RISTEK and BPPT gave wholehearted support that allowed me to investigate data and archives indispensable in developing the concept and which added substantial content in this book. Among of them are Kusmayanto Kadiman, Carunia Firdausy, Erry Ricardo Nurzal, Sohibul Iman, and Anwar Darwadi. The Graduate Program of Development Studies at Institut Teknologi Bandung (ITB) facilitated my research in Bandung for which I thank Muhammad Tasrif, Sonny Yuliar, Saswinadi Sasmodjo, Widjajono Partowidagdo, and all the staff at the program.

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Abbreviations

ABRI	Angkatan Bersenjata Republik Indonesia (The Armed Force of Republic of Indonesia)
AIPI	Akademi Ilmu Pengetahuan Indonesia (Indonesian Academy of Sciences)
AMRAI	American Regional Aircraft Industry
ATP	Advanced Technology Pertamina
ATTP	Advanced Technology and Aeronautic Technology (Pertamina)
BAKORTANAS	Badan Koordinasi Bantuan Pemantapan Stabilitas Nasional (Coordinating Agency for National Stability)
BAKOSURTANAL	Badan Koordinator Survei dan Pemetaan Nasional (Coordinating Agency for National Survey and Mapping)
BAPPENAS	Badan Perencanaan Pembangunan Nasional (Agency for National Development Planning)
BATAN	Badan Tenaga Nuklir Nasional (Agency for National Nuclear Energy)
BBI	Boma Bisma Indra
BIN	Badan Intelijen Nasional (National Intelligence Agency)
BLBI	Bantuan Likuidasi Bank Indonesia (Liquidity Supports of the Bank of Indonesia)
BPIS	Badan Pengelola Industri Strategis (Managing Agency for Strategic Industries)
BPPT	Badan Pengkajian dan Penerapan Teknologi (Agency for the Assessment and Application of Technology)
BPS	Biro Pusat Statistik (Central Bureau of Statistics)
BPUPKI	Badan Penyelidik Usaha Persiapan Kemerdekaan Indonesia (Investigating Committee for Preparatory Work for Indonesian Independence)
CASA	Construccionés Aeronauticas, S.A.
CIDES	Center for Information and Development Studies
CSIS	Center for Strategic and International Studies
DPIS	Dewan Pembina Industri Strategis (Advisory Council of Strategic Industries)
DPPP	Aircraft Research, Experiment, and Construction Department
DRN	Dewan Riset Nasional (National Research Council)

DSTP	Dua Satu Tiga Puluh (Two One Thirty)
FAA	Federal Aviation Administration (US)
G30S	Gerakan 30 September (September 30 Movement)
GBHN	Garis Besar Haluan Negara (State Guidelines for National Development)
Golkar	Golongan Karya
HFB	Hamburger Flugzeugbau
IAS	Indonesian Air Show
ICMI	Ikatan Cendekiawan Muslim Indonesia (Indonesian Muslim Intellectual Association)
IMF	International Monetary Fund
INA	IPTN North America
INKA	Industri Kereta Api Indonesia (Indonesian Train Industries)
INTI	Industri Telekomunikasi Indonesia (Indonesian Telecommunication Industry)
IPTI	Industri Pesawat Terbang Indonesia (Indonesia Aircraft Industry)
IPTN	Industri Pesawat Terbang Nusantara (Nusantara Aircraft Industry)
ITB	Institut Teknologi Bandung (Bandung Institute of Technology)
ITI	Institut Teknologi Indonesia (Indonesia Institute of Technology)
ITS	Institut Teknologi Sepuluh November (November 10 Institute of Technology)
KKN	Korupsi, Kolusi, Nepotisme (Corruption, Collusion, and Nepotism)
KOPELAPIP	Komando Persiapan Industri Pesawat Terbang (Executive Command of Aviation Industry Preparation)
KOPKAMTIB	Komando Operasi Pemulihan Keamanan dan Ketertiban (Operational Command for the Restoration of Security and Order
LAPAN	Lembaga Penerbangan dan Antariksa Nasional (Institute of National Aeronautics and Space)
LAPIP	Lembaga Persiapan Industri Penerbangan (Agency of Aviation Industry Preparation)
LEN	Lembaga Elektronika Nasional (National Institute of Electronics)
LIPI	Lembaga Ilmu Pengetahuan Indonesia (Indonesian Institute of Sciences)
LIPNUR	Lembaga Industri Penerbangan Nurtanio (Nurtanio Institute of Aviation Industry)
LOI	Letter of Intent
LPND	Lembaga Pemerintah Non-Departemen (Non-department Governmental Agency)
MBB	Messerschmitt-Boelkow-Blohm
MPR	Majelis Permusyarawatan Rakyat (People's Consultative Assembly)
OECF	Overseas Economic Cooperation Fund

OFP	Overseas Fellowship Program
P4	Pedoman Penghayatan dan Pengamalan Pancasila (Guidelines of the Learning and Implementation of Pancasila)
PAL	Penataran Angkatan Laut
PDI	Partai Demokrasi Indonesia (Indonesian Democracy Party)
PDIP	Partai Demokrasi Indonesia Perjuangan (Indonesian Democracy Struggle Party)
Persis	Persatuan Islam (United Islam)
Pertamina	Perusahaan Tambang Minyak dan Gas Negara (State Company of Oil and Gas)
PII	Persatuan Insiyur Indonesia (Indonesian Engineers Association)
PINDAD	Perusahaan Industri Angkatan Darat (Army Industry Company)
PKI	Partai Komunis Indonesia (Indonesian Communist Party)
PPFN	Pusat Produksi Film Negara (State Center for Film Production)
PPI	Persatuan Pelajar Indonesia (Indonesian Students Association)
PPP	Partai Persatuan Pembangunan (United Development Party)
PTDI	PT Dirgantara Indonesia (Indonesian Aerospace Corporation, IAe)
PTUN	Pengadilan Tata Usaha Negara (State Administrative Court)
PUSPIPTEK	Pusat Pengembangan Ilmu Pengetahuan dan Teknologi (Research Center for Science and Technology Development)
Repelita	Rencana Pembangunan Lima Tahun (Five-Year Development Plan)
RISTEK	Kementerian Riset dan Teknologi (Ministry of Research and Technology)
SESKOAD	Sekolah Staf Komando Angkatan Darat (Army Staff and Command School)
STAID	Science and Technology for Industrial Development
STMDP	Science and Technology Manpower Development Program
STS	Science, Technology and Society
TNI	Tentara Nasional Indonesia (Indonesian National Armed Force)
UI	University of Indonesia
UNIDO	United Nations International Development Organization
YLBHI	Yayasan Lembaga Bantuan Hukum Indonesia (Indonesian Institute of Legal Aid Foundation)

Introduction

> [I]ndonesia's first domestically produced aircraft, the N250 light commuter plane, is scheduled to make its maiden flight. Habibie has gambled his reputation on the N250, a 70-seater that he believes will compete well with European and American short-haul aircraft … But what if it all goes wrong? Some believe Suharto would not be able to save his old friend from such a high-profile disaster. If Habibie didn't resign, he would at least have to shed some of his power.[1]

Above is an excerpt from an article which appeared in Hong Kong-based *Asiaweek* a few days prior to a monumental event that marked one of the striking features of Indonesia's New Order authoritarianism. The report refers to the flight test of N250, a turboprop airplane developed and constructed by Industri Pesawat Terbang Nusantara (IPTN). It was a moment of truth for the New Order leaders, in particular President Suharto and his long-serving Minister of Research and Technology Bacharuddin Jusuf Habibie, for both led massive efforts to undertake one of the most ambitious technological projects ever seen in the developing world organized by the state. Through huge investments of tremendous financial and techno-scientific resources, Indonesian engineers managed to design and construct a highly sophisticated propeller airplane. *Gatotkaca*, a name inspired by a heroic character in Hindu-Javanese mythology, was given to the airplane by Suharto; the airplane was not only lavishly presented as a national pride and prestige but served a testimony of Indonesia's ability to compete with Western states.

Given its remarkable significance, the N250's maiden flight was critical not only to Habibie's political reputation, as *Asiaweek* skeptically predicted, but also to the whole program of high technology development to which the New Order regime had placed a great deal of tenacious attention. However, to the surprise of those who thought that Indonesia's first indigenously manufactured aircraft would fail, *Gatotkaca*'s maiden voyage was a success. This historic moment took place in the morning of 10 August 1995, which was deliberately planned one week before the celebration of the 50th anniversary of Indonesian independence. All members of Suharto's family, along with cabinet members, came to Bandung, a two-hour drive from Jakarta where IPTN was located, to witness the

success of the N250's flight over the Bandung sky. Tantamount to the excitement of the American people when cheering Apollo's moon landing, Indonesians observed this national achievement via television with much enthusiasm. When the plane took off, the spectators became overwhelmed with joy and pride. For the first time in public, President Suharto shed tears of pride while Habibie was extremely relieved and content about the result.

In the eyes of the New Order elite, the N250 was not just another airplane: it was an extraordinary high-tech artifact whose maiden flight signified the apex of the New Order's decades-long efforts to establish one of the most successful developmental authoritarianisms in Asia. At this point, Indonesia loomed as the potential next Asian Tiger, ready to join the growing influences of East Asian economies; even the World Bank's assessment of Indonesia seemed bright. Such a conviction occupied the minds of the New Order leaders who thought that all necessary pre-conditions for a take-off were in place, as the efforts to master high technology, regarded as prerequisite for modern nation-building, brought an expected success. It all started in 1976 when the New Order government decided to pour a vast amount of petrodollars to establish IPTN. Within ten years, IPTN turned into the fastest growing state-owned aircraft producer in Asia. The Indonesian aircraft industry was projected to become a global aircraft developer, able to challenge the dominance of the Euro-American airplane manufacturers. Conceived as more than just a state-owned corporation, the aircraft industry was the cornerstone of the New Order's technological vision to create the most technologically advanced society in the developing world. This ambitious vision entailed a colossal enterprise of establishing and administrating a host of techno-scientific institutions under the close coordination of the state. All these elements were arranged in such a way that would enhance the national capacity in yielding cutting-edge technologies. Supporting this institutionalization of high technology was intensive production of highly educated scientists and engineers, most of whom were trained in prestigious universities abroad funded by state budgets. Nevertheless, the New Order's high-tech vision suddenly ceased to exist when its institutional realization fell apart in the aftermath of Suharto's unforeseen downfall following the Asian financial cataclysm three years after the N250's successful flight. Consequently, the financial crisis ruined nearly all of the New Order's economic accomplishments.

The incredible endeavors the New Order government undertook in developing high-tech production capacity, and the way in which the state controlled strategic industrial sectors, suggest that the New Order was aiming for a developmental path different to those of other East Asian countries. This book argues that the excessive emphasis on the capacity to produce high technology (as the N250 project and later the N2130 jet airplane exemplify) is that the Indonesian developmental path, in particular during the late period of the New Order rule, diverged from the common trajectory that most Asian developmental states have followed, which was typically characterized by active state intervention in the economy.

This book deals with the question of how Indonesia's New Order embarked upon a developmental path directed by great enthusiasm for high technology. It

should be stressed from the outset that this book is not intended to describe the role of the state in underwriting technology transfer per se. Neither does it simply follow a "lighthouse" explanation, which is inclined to treat large technological construction as mere fulfillment for the state's narcissistic impulses. The task carried out in this book is rather broader and multi-dimensional; structure and culture form the core analytical framework used to identify every contributing factor that rendered Indonesia's proclivity toward technology-driven development experienced during the New Order period. To that end, this book revolves around the notion of "the technological state," a distinct form of developmental regime primarily characterized by a great desire to realize a vision of high technology. The following section will elaborate on what I mean by the technological state.

State ambitions to carry out megaprojects are indeed not unique to Indonesian experience. Such efforts to produce capital-intensive technologies have been present in other part of the developing world, notably China, India, Malaysia, and Brazil, to name a few (see Dai 1998; Kerr 2002; Jomo *et al.* 1999; Becker and Egler 1992). What distinguishes the Indonesian case, this book argues, lies deeply in state–technology relations. As this book will demonstrate, high technology developments constituted the primary goal the New Order sought to achieve particularly during its second 25-year development phase. Most intriguing from such a proximate relation is the way in which technology was institutionally entrenched in the state structure. This book suggests that to uncover the forces that shaped this penetrating structure, it is necessary to take a deep look at the reciprocity between technological development and authoritarian politics that resulted in the formation of the technological state. This book also posits that the emergence of this technological state was intimately linked to the authoritarian characters of the New Order regime, which extensively utilized organized violence from the moment it came to power throughout its 32-year rule. Thus, this book explains the role of technology not in economic terms, but more broadly in symbolic and ideological terms; these shaped the politics of the state and development, marking an epoch in Indonesia's modern history from the mid-1970s through to the end of the 1990s.

Despite neoliberalizing forces that have largely dictated political economic structures of increasingly globalized societies, the state remains a prominent political institution. To study the state, scholars have attempted to assess how the state performs across societies. Comparative studies of states have resulted in several binary notions useful in defining generalized characteristics of states, for instance, weak versus strong states, developmental versus predatory states, cohesive-capitalist versus patrimonial states, and so forth (e.g., Migdal 1988; Evans 1995; and Kohli 2004). This study, however, takes a different direction from those studying states in comparative modes, although some conceptual elements from these studies are incorporated in the book's overall framework. Highlighting peculiar techno-political circumstances of the New Order regime, this study presents a one-country observation, of Indonesia. A chief objective of this book is to explore the interplay between power, technology, and

authoritarian politics within a Southeast Asian context. It illuminates the political intricacies of socio-technological transformations that dominated development discourses at the height of the New Order. Despite the specificity of the empirical case concentrated on a techno-political analysis of the Indonesian aircraft industry, this book does not primarily aim to provide a historical account of the aviation industry in Indonesia. It is rather an attempt to traverse the assemblage in a Latourian sense (Latour 1988, 2005), of technological artifacts, institutionalized power, and political/technical actors that constituted the technological state. By the same token, this book seeks to identify fractures within the New Order regime that eventually caused the abrupt decline of the technological state when a global force engulfed its power. It thereby recounts when the Asian financial crisis severely struck Indonesia, resulting in a devastating impact on the technological state. This side story illustrates the contestation between the state and globalization.

The following sections present a set of arguments around which the empirical materials in this book are organized. There are three propositions that explain a triangular nexus of relations between three elements: technology, the state, and the socio-developmental experience in Indonesia.

Power, technology, and development

Development, as Arturo Escobar posits in *Encountering Development*, is a discourse aimed to produce "a space for the systematic creation of concepts, theories, and practices" that defines the possible path of social progress for the Third World (Escobar 1995: 39). As a Western project that began to spread to postcolonial societies in more organized ways after the end of World War II, development was propagated to Third World nations as the proper means to obtain the advancement of Western societies purportedly leading to socio-economic prosperity. Represented as a universal blueprint applicable to all societies, the developmental discourse revolved around a set of assumptions that emphasized, inter alia, the necessity for Third World societies to adopt modern technology in their efforts to alleviate long-standing miseries caused by colonial exploitation. Escobar notes that the discursive formation of development practices, which deemed technology as one primary component, originated in a speech Harry Truman delivered in his presidential inauguration ceremony in 1949:

> I believe that we should make available to peace-loving people *the benefits of our store of technical knowledge* in order to help them realize their aspiration for a better life.… Greater production is the key to prosperity and peace. And the key to greater production is a wider and more vigorous application of *modern scientific and technical knowledge*.[2] [emphasis added]

As Escobar observes, Truman's statement laid the foundation for the development assistance Western states sent to developing countries, desperately eager to

catch up with their former colonizers. It clearly signaled a message that modern technology would serve as a panacea for dire conditions in the Third World. The belief that technology was the key to economic productivity became reinforced in academic writing by modernist thinkers such as American economist Walt Whitman Rostow. Seeking to offer an alternative to Marxist propositions, Rostow postulates "the five stages of growth theory,"[3] which suggest that a traditionally economic society starts to grow once the insights of modern science begin to be translated into new production functions. He suggests that the application of technology is the pre-conditioning factor indispensable in the early stages of development.

Rostow's five stages of growth conspicuously reflect modernist biases, resting upon the assumption that Western capitalist experiences offer a more suitable option for non-Western societies seeking to alter production systems. This sort of imposing paradigm has received strong criticism from numerous fronts, most notably post-modernist sociology and anthropology that found modernization projects politically and culturally problematic (e.g., Ferguson 1994; Ong 1987; Edelman and Haugerud 2005). Notwithstanding these criticisms, the role of technology remains significantly emphasized in development discourses and it continues to influence directions of socio-economic transformation in the Third World. As technology is increasingly seen as an indispensable instrument to improve the conditions of post-colonial nations, studies on the application of technology for developmental purposes have arisen to understand the impact of technological change on socio-economic progress of the Third World. One typical approach employed to examine technological development in the Third World draws attention to technology transfer processes.[4] Most development economists often succumb to this perspective of technology and development, and thereby influence conceptual and policy discussions pertaining to the practices to boost transfers of technology that would benefit developing countries as the receptors. The technology transfer framework is materialistically oriented in a sense that its observations primarily concentrate on economically defined factors, namely capital mobilization and accumulation that facilitate movements of technology from developed to developing economies. As such, technology transfer theorists pay a great deal of attention to specific mechanisms through which technical apparatuses, knowledge, and innovation are transferred through trades and investments. Thus, acquisition of technology, foreign direct investments, and technology licensing, among others, are typically the main subjects in technology transfer studies.

Analyses framed within the technology transfer approach normally assume that capital constitutes the means as well as the end in technology diffusion. This implies that capital accumulation remains the ultimate goal in accomplishing the conveyance of cutting-edge technologies from advanced to disadvantaged areas. From a critical perspective, the notions of technology transfer follow the logic of technological determinism; a view that, in political scientist Langdon Winner's phrase, stands on two hypotheses: "(1) that the technical base of a society is the fundamental condition affecting all patterns of social existence, and (2) that

changes in technology are the single most important source of change in society" (Winner 1977: 76). Bearing a technologically deterministic view, technology transfer researchers are occupied by a positive image of technology bearing the capacity to produce wealth for the Third World poor.

The profound impact of technology on economic production is a conception no scholar would rebuke. However, the spectrum of technology as a complex system of technical knowledge and artifact creation transcends material interests, particularly in the post-colonial context (Anderson 2002). The main point this book attempts to put forward rests on a proposition that while technology plays a crucial role in development, the relationship between technology and development is multidimensional and that there is more to technology than just issues of transfer. Therefore, understanding the multi-faceted role of technology in development discourses requires more than what technology transfer explanations offer, for this approach is strictly limited to examining capital-related aspects; the movement of technologies across national boundaries is often driven by a broad range of interests by multiple actors that cannot be comprehensively analyzed under economic nomenclatures.

The pervasiveness of technology in the development discourse calls for an inquiry that incorporates what scholars of STS have provided to uncover a mélange of social, cultural, and political forces by which technology transforms, and is transformed by, society. The merits of the STS multidisciplinary lens in looking at the way technology interacts with society first comes from a series of studies that demonstrate in a myriad of examples how technology is culturally and politically embedded in social institutions.[5] These studies convincingly argue that technology does not emanate out of, and work in, a vacuum, but that it is essentially a product of society that travels from one social context to another shaped by a variety of prevailing societal forces (Anderson and Adams 2007). From the evolution of the bicycle, the construction of electrical systems, the development of nuclear power, to the invention of accuracy in weapon missiles, STS scholars have empirically confirmed that technology is born, and invariably attached to, specific social settings that forcefully define the efficacy of technical configurations, measurement techniques, quality standards and so forth, embodied in socio-technical systems. In other words, while rapid developments of technology massively alter the ways we interact, communicate, behave, and perceive our worlds, these developments inherently resonate with, and reflect, how we organize our society.[6] Such reciprocity is encapsulated in the notion of co-production between technology and society that marks considerable works in STS (Jasanoff 2004).[7] The co-production thesis (Jasanoff 2004) propounds that while technology appears to be a driving force in socio-cultural transformations, we should not treat technology as an entity that bears some internal logic free of social influences. Institutional conditions, group interests, ideology, political systems, cultural values, and systems of belief all contribute to the production of technological systems that characterize contemporary, globalized societies. And there is no reason to doubt that technological ramifications in the Third World development are observable from this perspective.

Furthermore, technology anywhere at anytime was never, and will never be, monolithic and neutral. Power relations often facilitate, and are mediated by, the construction of technical artifacts, be they simple or sophisticated. The mediation of power relations by technology, STS scholars suggest, should be probed by looking not only at material but also symbolic, ideological, and political realms.

It is in this line of arguments that this book intends to frame technology and development in New Order Indonesia. Acknowledging the complexity of technological development in the Third World signifies the crucial task this book aims to accomplish. In so doing, the notion of technology translation (see Callon 1986 and Fujimura 1992), instead of technology transfer, frames the approach this book relies on to uncover both material and symbolic registers embodied in the intercourse of technology and development as exemplified in Indonesia's experience. Technology is translated when the whole material and symbolic components are transformed from one context to another, a process mediated by particular institutional structures and grounded in an ideologically constructed environment. Such a process involves two interrelated dimensions this book aims to analyze: the cultural and the political. On one hand, the former presumes a translation of technology to be a cultural process in which symbolism constructs a set of ontological meanings embedded in the presence of technology. Technology translation, on the other hand, is political, for it is drawn by political forces that remarkably shape how development is perceived, conceived, and materialized. This entails a form of technological politics in which the pursuit of political ends is facilitated by technological means. The junction of the cultural and the political constitutes power, and power provides technology with the form and the soul it needs to build relations with individuals. This perspective allows one to interrogate the politics of technology at the core where power is produced and exercised within socio-technical realms. This book attempts to elucidate questions of how power shapes technological formation, and concomitantly how technology becomes the embodiment of power. As this is the main inquiry, the focus of analysis is placed upon a network of elite actors both technological and political, and situated in the sphere of the state.

The technological state

A fundamental point in studies on technology and development in the Third World context is the inevitability of realizing the pivotal role of the state in creating instrumental environments that allow both elements to intertwine. Following this direction, the whole process of technological politics this book aims to unravel revolves around the state as a prominent institution that governs social transformations in the developing world.

For the past 30 years or so, the state has been one of the most important subjects of inquiry in sociology, political science, and, to an increasing degree, anthropology. Growing attention to the state in social sciences is prompted by the fact that during the past century the history of human civilizations was

profoundly affected by the expanding power of modern states that brought about far-reaching implications for contemporary societies. It comes with no surprise that the state has become the gravity of scholarly investigation for many social researchers as modern states are seen responsible for advances in human development but also for production of human miseries. Using different empirical tools, social scientists have offered their explanations on power, authority, and structure of the state across societies. They have sought to understand how states have evolved into powerful institutions and what socio-political conditions allow states to dominate citizens.[8]

Scholars who study the behavior of states face a conundrum that states are complex and convoluted, a feature mostly attributed to the long history of modern state formation. Acknowledging the complexity of the state, it presents a large puzzle that takes continuous inquiries to solve. This as such results in multiple interpretations of how the state works and how it establishes relations with other social actors and institutions. In contemporary studies of the state, interpretations of features and structures of the state fall into two schools of thought that have, for the past few decades, influenced knowledge about the state across cultures. The division between these two camps lies in the debate on whether the state is always controlled by the interests of non-state actors or whether it is likely to hold institutional autonomy. The former is firmly upheld by Neo-Marxist scholars who believe that the state has invariably been part of the political economy shaped by capitalist interests (e.g., Tilly 1992 and Barrow 1993). This group of scholars asserts that state autonomy is consequently irrelevant because the capitalist class is most of the time able to use the state as a venue to extract surpluses. Thus, this camp seeks to bring to light macro structures in a given society in which the state is deeply penetrated by capital forces. The other school of thought follows insights from Max Weber who emphasized the possibility for the state to run on its own rationality and to fulfill its own interests. Defining the state as an entity that claims for the monopoly of legitimate violence, Weber is well known for his study on modern bureaucracy that served as the fundamental instrument of the state's legitimacy.[9] The publication of *Bringing the State Back In* (Evans, Rueschemeyer and Skocpol 1985) marked the return of the Weberian thesis and henceforth inspired investigations that followed Weberian arguments. The edited volume constitutes one of the most influential works in state studies that calls for re-assessment of the state's capacities to act as an independent actor in structuring political economy in society.

Weberian arguments found empirical grounds from studies on economic progress that accelerated in late industrializing countries of East Asia during the 1950s until the 1970s. The supremacy of state institutions was brought to the fore as the major factor in explaining why economic development and industrial growth was exceptionally successful in Japan, South Korea, and Taiwan, but failed to take off in other economies. No works on East Asian development are more influential than Chalmers Johnson's *MITI and the Japanese Miracle* (1982) in which Johnson first coined the term *developmental state.* Drawing on a distinction Weber made between a "market economy" and "plan rationality,"

Johnson emphasizes the developmental state as distinctive from either the plan ideological Soviet type of state or the market-regulating type, such as the United States. This state form, Johnson maintains, is primarily characterized by the proclivities to take on development functions and the setting of substantive social and economic goals. The developmental state, as Johnson puts it, is "the plan-rational state" in which "the government will give greatest precedence to industrial policy, that is, to a concern with the structure of domestic industry and with promoting the structure that enhances the nation's international competitiveness" (Johnson 1982: 17). The publication of his book afforded Johnson a strong reputation among scholars studying the state and his analytical framework began to influence works on the state and development. Despite a few criticisms regardign Johnson's seemingly overemphasis on the functioning of bureaucracy,[10] the developmental state arose as an organizing concept adopted by numerous social scientists to reveal the key to successful rapid industrialization in East Asia. Others used the concept in comparative observations across nations to expose the structural failures in other states that limited their ability to effectively industrialize.[11] In its evolution, the concept was enriched through modifications put forward by a number of works that shed light on multiple dimensions of state institutions. These studies sought to assess the extent to which the state is able to retain autonomy and to develop capacity in order to pursue developmental goals. Peter Evans (1995), for instance, added the notion of *embedded autonomy*, which defines the way in which state autonomy is established through informal relationships between state actors and non-state organizations. In a similar vein, Atul Kohli (2004) establishes another term, *the cohesive-capitalist state*, which is used to explain the patterns of state construction and intervention that led South Korea to join the "industrialized nation club" in a relatively short period. In sum, works on developmental states illustrate the working of state institutions in structuring a political economy in which state autonomy and capacity are two key factors in the massive success of developmental enterprises in East Asia and beyond.

Departing from the notion of developmental state, the present study takes on a similar yet slightly different framework to account for a state formation in Indonesia during the New Order rule. Placing more emphasis on the state's approach to institutionalizing high technology within state structure, this book illustrates a peculiar type of state that I shall call *the technological state*. This concept extends the framework of the developmental state. In essence, the technological state shares a few main features with the developmental state. These include, inter alia, the impetus to achieve high economic growth, state interventions in industrial policies, the strong presence of bureaucracy in policymaking, and the hegemony of technocratic rationality. However, while the developmental state, as Johnson and others define it, is structured around a set of interests in formulating and pursuing high growth in industrial production, the core of the technological state resides in the interplay between technology and state politics.

The technological state is defined as a state with a political economy that is largely structured by a macro vision of socio-economic transformations which

places a strong emphasis on state-led rapid technological development. To define the technological state, I discuss three essential features that distinguish it from the developmental state. First, the primary interest of the technological state transcends economic growth, to which the developmental state gives priority in the planned acceleration of industrial outputs. Higher degree of technological supremacy appears to be more desirable to the technological state and thus becomes the measure of success. The pursuit of technological supremacy, it should be noted, does not necessarily mean that efforts to make economic progress do not deserve attention. In the technological state, it is assumed that technological supremacy and economic wealth come once the nation's competitiveness in the global markets is improved through technical advances. The bottom line is that technology not only serves as a means of prosperity but, more importantly, it constitutes the ultimate end the state seeks to pursue through state-concerted undertakings. Such a vision in technological superiority is analogous to what James Scott has labeled *high modernism*, "a particularly sweeping vision of how the benefits of technical and scientific progress might be applied—usually through the state—in every field of human activity" (Scott 1999: 90). The corollary of such a view, which places technological means as the main instrument of socio-economic engineering leading to the creation of a new society, appears in large-scale investments to boost the state's technological capacities.

Second, to follow a Neo-Weberian thesis, institutional autonomy boosts the formation of the technological state. This aspect has been specifically noted with regards to the developmental state above. The technological state, however, diverges from the developmental state in the extent of autonomy the state has in structuring the political economy. We learn from Peter Evans that autonomy of the bureaucracy in developmental states is somehow entangled in the web of state–society relations. This implies that the developmental state does not attain complete autonomy but rather autonomy is embedded in the interface between state and non-state actors such as business groups, professional clubs, and social organizations.[12] In the case of the technological state established in Indonesia's New Order authoritarian regime, the state institutions directly related to technological production were nearly autonomous and relatively isolated from market forces. Penetration of non-state actors into the state programs remained incredibly sparse as the state bureaucrats were structurally protected from external influences.

Lastly, while the developmental state secures legitimacy from its institutional ability to provide its population with well-being improvements, accomplishments in high technology acquisition and independent development constitute the basis of legitimacy for the technological state. Thus, the functioning of state institutions is mostly concentrated on the organized efforts to construct sophisticated technological artifacts lavishly presented to the public. In this light, it is conceptually productive to subscribe to the cultural approach in state theory that offers multi-faceted explication to make sense of the ways in which state structures are constructed and arranged around a set of cultural assumptions.[13] One pivotal aspect in cultural analysis of the state is symbolism, which appears

profoundly significant as it is embedded in the presentation of state-produced technologies in order to cultivate popular support for the state. Explanation for this draws on David Nye's (1994) observation on how technological objects spawn subliminal effects that are likely to elevate the image of the creator. The presence of impressive technological objects in any society, Nye argues, is invariably integrated into social fabrics, and when encountered by large groups it arouses a religious feeling that eliminates social divisions in society. In the moment of sublimity, people are astonished by impressive technological artifacts constructed in such a way by state engineers, and easily succumb to the power of the state as the main producer of awe-inspiring technical objects. As a result, the capacity to produce high technology objects, those that could unite all members of society in one collective identity, affords the state the legitimacy it desires. Clifford Geertz's work on the state theatre is highly relevant in this characterization. In his anthropological account on the Balinese state, Geertz asserted that the entire source of power that underpinned the legitimacy of the state resided in court rituals and ceremonialism that served as the material embodiment of political order. "Power served pomp, not pomp power," he declared (1980: 13). Drawing on a Geertzian model, I argue that the whole arrangement of the techno-political system that includes material and symbolic construction constitute the embodiment of the state's power. This approach finds a parallel in Patrick Carroll's (2006) observation on material construction of the modern state. In a similar vein, this book seeks to display that state authority is manifested in the realms of technology and it is the perceived superiority and elegance of technical artifacts that set the stage on which the state exhibits power.

Despite the three aforementioned features, there remains one commonality between the technological state and the developmental state: both contain elements of nationalism that shape the logic and rationality of the state in formulating policies and in pursuing its ultimate goal. As scholars of the developmental state have described, nationalism largely pushed the acceleration of developments in East Asian nations. Johnson, for instance, notes how the ideology of nationalism prompted Japanese policymakers to launch economic policies that gave priority to their industries' interests such that they enabled national industries to compete with those from Western industrialized nations.[14] In Indonesia's technological state, the nationalistic aspirations appeared equally profound, though more nuanced than merely concerned with national competitiveness. Elsewhere I have illustrated the nature of nationalism that forged policies of high technological development in Indonesia during the New Order era (Amir 2007). When embedded in technological construction, the ideology of nationalism was manifested in three goals the state was adamant to achieve. First and foremost, the New Order state used technology as a repertoire to construct a national identity supposedly to unify Indonesia's diverse cultures. Second, it developed high-tech based industries as a means to assert national sovereignty, which was defined by self-sufficiency in technology supply. Third, the New Order state mobilized resources for cutting-edge technologies that empowered the state to integrate the whole nation, culturally and geographically.

Indonesia's New Order: from developmental to technological state

The sheer size of its population, about 80 percent of which are Muslims, renders Indonesia the most populous nation in Southeast Asia, and the fourth in the world after China, India, and the United States of America. As such, Indonesia plays a major role in the stability of the region, economically and politically. A little shake in the behemoth would cause anxiety to spread to neighboring countries. The diversity of cultures and religious beliefs are integrated within one nation bearing the national slogan of "Bhinneka Tunggal Ika," which symbolizes multiculturalism. The Indonesian state inherited its large territory from the Dutch, who occupied the archipelago from the nineteenth century. As a post-colonial state, Indonesia is a product of nationalist movements rooted in anti-colonial sentiments propounded by the founding fathers. What constitutes Indonesian nationalism today was much defined by the republic's first president, Sukarno, who blended European idealism with indigenous values influenced by ancient Javanese culture.

Ideas of Western-modeled development were introduced to Indonesia only after Suharto came to power in the aftermath of a silent coup that ousted President Sukarno from office in 1967. Mostly caused by the inability of Sukarno's ideologically focused government to make economic progress, an economic chaos conspicuously marked the beginning of Suharto's rule. Tired of Sukarno's leftist proclivities, Suharto saw the development concept brought in by a group of American-educated economists[15] as the most plausible path towards economic recovery. At this point, Suharto had become the leader of the New Order regime, holding unassailable power to rule the country for the next three decades. In the late 1960s, political uprisings were coercively dismissed and the New Order immediately started to implement capital-oriented economic development with directions and assistance from Western powers. For over 30 years, the New Order's developmental programs transformed the basic structure of the economy, emphasizing rapid industrialization and modernization. Following the experiences of East Asian industrializing nations during this period, Indonesia was among a few countries in the region whose leaders believed that economic development was a call of history they ought to respond to in order to prevent their nations from plunging into further turmoil. Thus Indonesia, along with Malaysia, Thailand, and Singapore, arose as a group of the late industrializing countries that sought to develop their economies based on Western methods, resulting in robust industrialization that have impressed many world economists, earning them the sobriquet "New Asian Tigers" (see for example Lall 1997). Given its large, diverse population, Indonesia plausibly became the center of attention among development observers for its ability to undertake massive economic transformations with relatively smooth processes.

Similar to a few cases of Asian developmental states, the success of the New Order in releasing all of the society's economic potentials to fuel a machine of growth required the state's capacity to discipline society. This was achieved

through an authoritarian political system cunningly designed by Suharto and his elite circle in such a way to quell dissenting voices deemed disruptive to the continuity of development. The logic that guided the New Order authoritarianism operated along the lines of capital interests in which development functioned to stimulate capital accumulation, which was regarded important to improve the livelihood of the people. As a result, the New Order's rapid industrialization gave rise to the capital class, which Richard Robison (1987) observed during the height of the New Order. Using a Neo-Marxist framework, Robison highlights the role of the New Order state in structuring the political economy to bridge domestic capitalists and global capital powers. The ability of the New Order state to accumulate capital and to discipline labor came from a peculiar structure of power shored up by three pillars, namely the military, the bureaucracy, and the ruling party, Golongan Karya (hereafter Golkar).[16] The three elements constituted the foundation of Suharto's extended power all the way down to villages, emulating a pyramid with Suharto at the apex. Given this form of structure, many scholars of Indonesian politics seem to be convinced that the New Order was essentially a personal regime with Suharto standing at the center (Liddle 1985). Such a conclusion is normally informed by interpretation of the concept of power in Javanese culture that Benedict Anderson (1990) eloquently elaborates in his widely cited essay on how power is construed in Javanese quasi-mysticism. Resorting to a Weberian view, Harold Crouch (1979) defined New Order politics as a form of "neopatrimonialism," a power relation that revolved around Suharto's persona with the military as the bedrock. Then came Adam Schwarz's (1994) detailed investigations on power struggles between the New Order elites, which depict maneuverings among Suharto's men, implying that New Order politics was more complicated than generally assumed. Various actors from different groups sought to influence Suharto's political decision-making to fulfill their personal agendas.

In sum, studies on Indonesian politics have attempted to delineate the reciprocity between authoritarian power and economic progress; that is, how authoritarian politics paved the path toward economic development, while at the same time steady economic growth increased the leverage of the Order leader.[17] Certainly, we should note that Suharto's concentrated power came with a high price as it resulted in many forms of power abuse, from absent public accountability to human rights violations, all of which signified troubled relations between the state and civil society. As has been detailed in many works, Suharto's New Order had a notorious reputation for suppressing workers, student activists, communist-alleged groups, and other pro-democracy organizations. Inevitably, the New Order's development was marked by years of state-organized violence,[18] or what Ariel Heryanto (2007) categorized as "state terrorism," to which the New Order resorted in order to maintain the political stability deemed essential for continued development. All these sociological accounts contribute to understanding the idiosyncratic formation of the developmental state in Indonesia, and reveal the interplay between authoritarian power and the ideology of developmentalism that shaped the political economy of Suharto's New Order.

What is largely absent in the big picture of the New Order's developmental history, this book argues, is the shifting of the New Order political economy from a developmental state to a technological state. This subtle transformation is overlooked by many observers most plausibly due to trivialized roles of technology in the developmental process. As I have already explained, this widely shared oblivion is caused by assumptions that technology is merely a production instrument devoid of political forces.

This book posits that the shift from the developmental state to the technological state that gradually took place from the mid-1980s until the end of the New Order period is significant because it entailed two fundamental changes that dictated, to follow Michel Foucault, the governmentality of the New Order state. One is epistemological, the other structural. In the epistemological switch, the transformation from a developmental state to a technological one appeared through the utilization of an engineering logic that came to replace the market-minded economic rationality. The distinction between both will be discussed at length in Chapter 3, but it is instructive to briefly mention some basic elements here. While the latter is concerned more about how the state ensures appropriately functioning market systems that generate wealth, the former is partly inspired by a neo-Schumpeterian view in which technological innovations are believed to be the primary source of growth that one nation should cultivate in order to enhance the capacity of domestic economy amidst international competition. Furthermore, the engineering-informed logic places state interventions as the primary instrument indispensable in creating an atmosphere where technological progresses are accomplished within state-directed institutions. Thus, the engineering logic stands vis-à-vis the liberal economic rationality in terms of what roles the state must play in industrial production. The corollary of this shift is that it affected the ultimate goal the New Order initially sought to accomplish. The second interrelated feature in the shift relates to the bureaucratic structure of the central government. This refers less to alteration of the entire bureaucratic landscape than to the transposition of the center of gravity in the central bureaucracy in which technological-related governmental agencies seized greater authority in mobilizing resources of the state.

The implications of this shift were enormous because it took place along reconfiguration of power relations that underpinned the stability of the New Order authoritarianism. The shift was intensified especially when entering the 1990s, a decade that witnessed the rise of new, previously less powerful actors, who came to influence the domains of policymaking and practical politics. In the policymaking arena, one could get a sense of the growing influence of a group of engineering bureaucrats who expanded its power from a very specific policy domain to a much broader spectrum in development management. Revolving around the persona of the engineers' leading figure, Habibie, the Muslim modernist groups arose in practical politics, a territory traditionally dominated by the military elite. The alliance between the engineering technocrats and the Muslim modernist politicians became a new source of power that Suharto and his most trusted lieutenant mobilized throughout the

New Order rule. More importantly, these reconfigured power relations provided political and institutional advantages to the formation of the technological state as will be illustrated in Chapter 2.

My argument on the formation of the technological state lends supporting evidence to three visible indicators that characterized the way in which the New Order's political economy in the 1990s was structured, discursively and institutionally. First, there arose a new vision that departed from new teleology projecting the sort of society the New Order pledged to bring into existence in the near future. This new vision was ideologically grounded upon the imagining of a prosperous Indonesia, the wealth of which was primarily generated from its capacities to produce advanced technology. Such a far-sighted vision ubiquitously appeared in Suharto's official messages and a variety of state policy texts. Second, the authority to determine priorities on developmental projects moved from the hands of the market-inclined economists to those of the nationalist-oriented engineers. This is evident in the way technology-related agencies influenced decision-making in a broad range of public sectors previously controlled by the economists. Lastly, the formation of the technological state entailed mobilization of state resources, including political, financial, intellectual, and institutional resources, into specific agencies and projects designed to enhance the state's capacities to perform basic scientific research and technological innovation and to transform research outputs into industrialized high-tech products.

We now arrive at the question of why the New Order drifted towards a direction that prioritized, despite other options being available, the pursuit of technological prowess accomplished through state-concerted efforts. What was the chief impetus that forced the formation of the technological state in Indonesia's New Order? A common response would refer to vigorous global economic competition in which technological advantages became increasingly important to win international markets. For a more satisfactory answer, however, it is necessary to examine the authoritarian nature of the New Order. In this light, the technological state was a response to a new need fermenting in the New Order authoritarianism to seek for a stronger basis of legitimacy. At the height of the New Order power in the early 1990s, the success in maintaining steady economic growth for years became seemingly insufficient to retain political support from Indonesian society, of which many members had enjoyed social progress and become increasingly critical to Suharto's authoritarianism. The rise of a new middle class in developed urban places, a group that benefited the most from the wealth accumulated by the New Order's industrial development, posed a challenge to the New Order leader. General improvement in secondary education consequently raised political consciousness among the urban middle class, which demanded greater freedom for political expression unfettered from state oppression. Suharto was acutely aware of this trend. Coping with such fragility, the New Order leader believed that a new vision that forged an image of modern Indonesia was necessary to sustain popular allegiance.

How and to what extent did the formation of the technological state serve the interest of the New Order in reinforcing its legitimacy to prolong its rule?

The New Order arose from a history of violence and it always sought to blur its dark side by establishing a fundamentally strong association to the rationality of modern science and technology. Its leaders wished to vindicate the history of suppression through the presence of magnificent technologies created by its hands. Embarking from the violent nature of the Suharto authoritarianism, this book argues that the technological complex built by the New Order state was technically and symbolically constructed to transform the state's violent ideology into a socio-technical progress that projected an image of a technologically advanced state. Mass enthusiasm for high technology, coupled with the rhetorical ability of magnificent technical objects to mesmerize the public, helped the technological state to reach this end. An array of large-scale technological projects carried out through the institutionalized scientific and technical developments projected an image of the New Order as a rational state. The success of the N250's maiden flight, which inspired awe among the Indonesian public, exemplified this. Nevertheless, the technological state failed to sustain the New Order's power due to a number of factors that will be discussed in detail later in this book. In the aftermath of the New Order's sudden collapse, almost all the technological agencies and projects that the New Order had nurtured for two decades were instantly dismantled. Despite its tragic termination, the New Order's technological state constitutes a historical force that significantly shaped the political economy of Indonesia towards the end of Suharto's regime and marks one important episode that exhibits Indonesia's keen ambition to catch up with advanced industrialized nations.

Outline of the book

Understanding the formation of the technological state in the New Order Indonesia requires the uncovering of facts and artifacts that overlap one another. In so doing, this book traverses into the phenomenon by taking an approach of peeling an onion layer by layer from macro, to meso, to micro parts, on which this book builds a line of narratives to convey how the technological state was imagined and materialized. At the outer layer lie the power relations and the ideology that builds such a structure. The first two chapters serve to peel off this layer. Specifically, Chapter 1 delineates the whole backdrop against which the junction between authoritarian politics and technological development occurred. It first traces back the genealogy and ideological foundation of the New Order authoritarianism and reveals a set of technologies of violence that were extensively used by the New Order state to suppress dissenting voices critical to the regime. The chapter continues to examine the structure of the New Order's power that consequently enabled Suharto to have a strong grip on politics for over three decades. Arriving at a more micro level of power relations, Chapter 2 describes close connections between two central figures in the New Order politics: Suharto and Habibie. This chapter posits a theory of symbiotic mutualism between the two and explains how that form of power relation spawned centrifugal effects on the political economy of the New Order development, in particular during the

1990s. In addition, this chapter discusses the mutual link between Habibie's high-tech vision and the rise of political Islam; a political collaboration from which the New Order's technological state cultivated endless support.

The second layer of the onion contains the institutional formation of the New Order technological state. This is what Chapter 3 and Chapter 4 together aim to recount in more detail. Chapter 3 takes on the bureaucratization of engineering sciences, which was incorporated by the New Order administration from the outset, and later expanded massively as the chief component of the technological state. The chapter specifically focuses on the role of *Badan Pengkajian dan Penerapan Teknologi* (BPPT, the Agency for Assessment and Application of Technology). In addition, the politics of technocracy and its implications for bureaucratic organization of the New Order state are other important issues highlighted in this chapter. The chapter discusses the practices of strong technocracy, which constituted the central logic of the New Order's authoritarian governance, marked by the powerful operation of technology-oriented developmental institutions. A host of state-funded research agencies and strategic industries were formed and centrally coordinated to catalyze socio-technological progress. The end of the chapter examines the struggle over influence between the engineers and the economist technocrats due to conflicting views about the role of the state and the market in development; this caused fractures in technocracy, leading to a dramatic failure of the technological state at the end of the New Order era. Chapter 4 highlights aspects that were critical for the institutionalization of high-tech-based industrialization. This chapter first takes a critical look at Habibie's concept of "leapfrogging" and its pervasive influences on the New Order's developmental logic which, as this book explicates, led to the formation of the technological state. The gist of the chapter is an account of the establishment and the role of *Badan Pengelola Industri Strategis* (BPIS, the Managing Agency for Strategic Industries). This is the core of the technological state that was meant to transform research and innovation outputs produced by BPPT into industrial products.

Finally, the last layer of the observation of the technological state comprises the material and symbolic dimensions of technology. This is where a successful formation of the technological state is indicated by technical ideas, concepts, and products brought about through tenacious efforts taken by state engineers in carrying out scientific research and technical developments. Chapter 5 shows how the logic of the technological state was manifested primarily in the establishment of the Indonesian Aerospace Industry (IPTN), which Habibie and his engineers group proposed as a strategic model for Indonesia's accelerated transformation. Hence, this chapter provides a detailed account of the evolution of IPTN from a small airline depot into a world-class aircraft manufacturer. Organizational aspects of the industry are described to reveal how the New Order's desire to develop state technological capacities was channeled through a colossal enterprise within the industry. Chapter 6 features a showcase of a historic project of high technology development, which represents an important stage in accumulation of knowledge and technical capabilities of the state. The focus is placed

upon the N250 airplane to illustrate materialization of the technological state's ideology upon a technical product constructed within a *sui generis* configuration that blended the state's nationalistic aspirations with engineering calculations. The project is profoundly significant, for the New Order treated it as a national hallmark that started the phase toward a take-off society. The chapter also documents IPTN's more ambitious program, the N2130 jet commuter. The New Order envisaged the jet airplane program as elevating Indonesia to greater heights in the high technology arena. As this chapter notes, this technological advance signifies the growing power of the engineering technocrats in steering the state to channel massive resources into technologically strategic sectors.

Chapter 7 recounts a course of events that ended with the breakdown of the New Order power after the Asian crisis painfully struck the Indonesian economy in 1998. The chapter briefly discusses the origins of the crisis and the damage it caused to the whole economy. It then extends this examination to see how global forces came to dismantle the edifice of the technological state built by the New Order. Furthermore, the chapter describes dire situations within the technological agencies, particularly the aircraft industry, following the downfall of Suharto's regime. This chapter ends by analyzing the meaning of what had unfolded to the New Order political figures, engineering elites, and Muslim leaders who all share deep concern about the fiasco in Habibie-led high technology programs.

In conclusion, I shall summarize the entire historical interplay of events conveyed throughout the book and elaborate generalizable features, and also particular traits, of the technological state in Indonesia. Subsequently, a discussion is presented on the consequences emanating from the junction between authoritarian politics and technological development, and on tensions between the technological state and globalization. The concluding pages provide theoretical implications of the technological state concept in political studies of technology, the state, and development, particularly in the Asian context.

1 Authoritarianism and technocracy

The New Order is a total correction to all wrongdoings by the Old Order.
Suharto[1]

The source of authority in authoritarian government is always a force external and superior to its own power;… from which the authorities derive their "authority," that is their legitimacy, and against which their power can be checked.
Hannad Arendt

History was rebooted in Indonesia when Southeast Asia became the ground zero of the Cold War. As the region's social political landscape succumbed to a global competition between two superpowers, Indonesia entered a new era marked by a set of fundamental transformations brought about by a new elite group that sought to modernize the country in accordance with development virtues. The conjunction of global forces and domestic dynamics during this period gave rise to the formation of the New Order state that ruled Indonesia for over three decades, and the legacies of which linger long after the departure of its strongman.

What was the "New Order"? What was the primary objective it aimed to accomplish? How was the power of this authoritarian regime structurally supported, and by what forces? Studies on the New Order authoritarianism are plenty. Several observers have sought to explain the characteristics of the New Order politics by shedding light on how it maintained power through extensive mobilization of the military. The striking presence of military persons at the helm of the political structures of the regime prompted many analysts to describe the New Order as a typical "Third World military regime" though with notable distinctions (e.g., Crouch 1972, 1979; Jenkins 2010; and Said 2006).

A different mode of analysis focused attention on Suharto's pivotal role with all of his idiosyncratic proclivities in controlling Indonesian politics for nearly half of his lifetime. As shown in various works by foreign observers, the longevity of the New Order was largely attributed to the ways in which Suharto cleverly built political relations and institutions in such a way that enabled the

New Order to wield massive power. These works usually revolved around Suharto's personal biography, depicting the New Order as a personal regime by emphasizing the political economic decisions Suharto made during his reign, which were commonly seen to protect and enrich himself and his cronies.[2]

From the structuralist view, a number of Marxist-inclined scholars took a political economy perspective to squeeze out the essence of the New Order authoritarianism situated in the context of the expansion of world capitalism. For instance, Richard Robison (1987) and Jeffrey Winters (1996) pointed to structural mechanisms institutionalized by the New Order state to foster capital accumulation. Critical in their examinations, these scholars highlighted the consequences of the New Order political economy for workers, farmers, and other lower-class groups who suffered the most from state policies while the interests of foreign and local capitalists were unrelentingly accommodated (see for example Hadiz 1997; and La Botz 2001).

The variety of conceptual explanations of what constituted the New Order and the way it operated demonstrates the multi-faceted nature of this authoritarian regime, which have shaped Indonesian polity in general and the Indonesian state in particular. I do not disagree with how Indonesianists have defined the longest ruling power in modern Indonesia. However, I would like to conjure a different view, though incorporating existing definitions, one that examines the New Order from its epistemological underpinnings that made the remarkable traits of the New Order state. That the New Order had extensively relied on the military to secure its power, had placed Suharto at the apex of political hierarchy, and was set to accumulate capital for the sake of its elites are facts that need no objection. However, the aforementioned analytical approaches leave out, or at best undermine, a key element that came to define the New Order regime as a modernizing project; an element that fashioned the core of the state and had far-reaching implications for Indonesia as a whole. I would like to emphasize that it was technocratic power that provided the New Order with the capacity to design and arrange the socio-economic order from which it gained legitimacy for a long period of time. Utilizing the premise of how technocracy took root in the New Order state and informed many of political economic decisions its leader made to pursue its objectives, this chapter aims to elaborate by discussing four aspects that characterize the technocratic foundation of the New Order state.

Violence as the beginning

As with any authoritarian regime, the New Order had its own version of history that provided the grounds for its existence. In the official narrative of the New Order, its birth was portrayed as emanating from extraordinary circumstances triggered by a bloody episode on 30 September 1965. During the early hours of that day, six army generals and one lieutenant were kidnapped at their residences in Jakarta by a small army, appearing as the Presidential Cakrawibawa Guards, commanded by Lieutenant-Colonel Untung Syamsuri. The high-ranked military officials were taken by force and killed at a location near the Halim Perdana

Kusumah Airport on the outskirts of Jakarta, later to be widely known as "Lubang Buaya" (Crocodile Well). Concurrently with the kidnapping, Untung's armed battalion seized national communication outlets, including the Republic of Indonesia Radio (RRI) station to broadcast his political messages. Calling his action "the September 30 Movement" (G30S), Untung rationalized the kidnapping of the generals in his speech as a necessary pre-emptive strike against a plan by what he referred to as the "Council of Generals" to take over the government. To be in charge of the government, Untung declared the formation of "the Indonesian Revolution Committee." Untung's movement, however, was short-lived. The following day, Suharto, then head of Army strategic reserve command Kostrad, carried out military action on the attempted coup and succeeded in suppressing the G30S movement. The success of Suharto's prompt responses to curb Untung's unprecedented coup led to a situation that compelled President Sukarno to confer authority upon Suharto to handle the crisis. Suharto instantly seized this opportunity to take over the leadership from Sukarno, marking the decline of Sukarno and the beginning of Suharto's reign in Indonesian politics, which lasted until the late twentieth century.

What had really transpired, how and why the G30S took place, and which actors were mostly responsible are questions that have been hotly debated among most observers. Numerous scholars seeking to investigate into this important part in the history of the New Order came up with different explanations. Discussions of varied interpretations on this particular event are beyond the purpose of this chapter. Worth noting is what appears to be the most frequently cited work produced by two researchers at Cornell University (the Cornell Paper). In the paper, which attempted to remove the shroud cloaking the G30S coup, Benedict Anderson and Ruth MacVey posited that the G30S movement was a byproduct of internal Army affairs caused by a sharp division between those who envisioned military transformations towards a more centralized force and those aspiring for a decentralized model. The actual masterminds behind the G30S coup, Anderson and MacVey suggested, were to be found among middle-level Army officers in Semarang. More important in the Cornell Paper is the conclusion that neither the Indonesian Communist Party (PKI) nor President Sukarno were implicated in the Untung coup.[3]

Contrary to the Cornell Paper, the New Order spread its own version of the truth with regards to the failed G30S coup. From the outset, Suharto had suspected that the G30S movement was plotted by the PKI.[4] He strongly believed that Untung was only a pawn of the PKI, then the largest political party and the closest ally of Sukarno, being used to materialize the party's agenda of establishing a communist government in Indonesia. This immediately became the popular narrative propagated by the Army in the aftermath of the G30S.[5] The narrative overstressed the evil intention of the communists to seize power through any means necessary. It was publicly circulated in newspapers and later justified in official publications produced by New Order historians (McGregor 2007). The narrative included detailed descriptions of how the communists mercilessly killed six generals and one lieutenant.

The allegation that the PKI was mostly responsible for the killings precipitated a horrifying consequence that signified the ascendancy of Suharto into power. Fully backed by the Army, he began a systematic pogrom against all PKI members, which lasted continuously from 1965 to 1966. The image of the PKI as a dangerous organization threatening the safety of the nation constituted the pretext for the military-organized murders of Indonesian communists, for which the United States provided significant support.[6] During 1965 and 1966, thousands of artists, intellectuals, and civil servants, directly and indirectly connected to the PKI, were put in jail without trial. Within one year, the second largest communist party in the world had been completely wiped out. A modest estimate would be that approximately 500,000 PKI members were slaughtered. In-depth investigations indicated that the number of victims could possibly reach 1 million people, elevating this massacre towards one of the largest recorded in the twentieth century.[7] A more poignant fact was the participation of religious organizations and youth groups in the hunting, torturing, and killing of the individuals allegedly affiliated with PKI. This left a deep wound in the memories of many Indonesians. Today the trauma is still largely felt in Java and Bali and the effort for reconciliation was never materialized.

The 1965–66 mass killings played an important role in the establishment of the New Order as it taught its lead proponents a lesson that violence was the most effective way to bring its greatest political enemy down once and for all. As Ariel Heryanto (2006) aptly argues, the PKI massacre laid the foundation of the New Order as an authoritarianism that relied heavily upon the machine of violence institutionalized within the state. After the nation-wide annihilation of the PKI, violence continued to function as the primary instrument utilized by the new regime to subdue politically-oriented groups deemed to bear the potential to invoke instability in the state. Right from the moment it took power, the New Order built peculiar mechanisms that were meant to keep the entire population under its control. These were implemented extensively through military forces that stretched from Jakarta to villages all around the country. In addition to military forces, government-supported mass organizations coordinated by state actors were mobilized like gangster-like groups to protect the state's power.[8] The New Order never hesitated to resort to violence when dealing with the dissenting voices of pro-democracy movements. As a result, Indonesia witnessed intensive brutality by state apparatuses against civil society for 32 years under the New Order regime. Those taking a stance against the New Order's interests were considered subversive and often subjected to direct military handling. Lead figures of opposition groups were jailed and many anti-Suharto activists were coercively made to "disappear." The success of the PKI purge had laid the grounds for a variety of state violence that was massively practiced by the New Order state to ensure a complete subjugation of the entire society.

The magnitude of the 1965–66 killings defines the general character of the New Order as a violence-prone regime. However, its implications touch upon one significant factor that firmly influenced how the New Order structured its political economy. It correlates to another striking feature of the regime relating

to state policymaking, namely technocracy. Just as the perpetrators of the PKI massacre were never revealed, it is also unclear to what extent this dark history implicates a group of economic technocrats who set up the foundation of Indonesia's modern economy and developmental visions quickly after Suharto came into power. These economists were lecturers at the University of Indonesia's Faculty of Economics. They were all protégés of Sumitro Djojohadikusumo, an academic-cum-politician, who fled Indonesia in the late 1950s after getting involved in a separatist movement. During the 1950s, Sumitro broke a deal with the Ford Foundation to grant scholarships that allowed his students to study abroad. A few of them went to the University of California, Berkeley, where they finished doctoral degrees in economics. The prominent figure of this group of technocrats was Widjojo Nitisastro, who became the dean of Faculty of Economics at the University of Indonesia (UI) after he returned from the United States in the early 1960s. Other well-known figures include Emil Salim, Ali Wardhana, Muhammad Sadli, and Subroto. These young economists constituted the first generation of technocrats in post-independence Indonesia that molded the face of Indonesian economy. They were the architects of the New Order development and their involvement in the New Order's economic reforms created a watershed in the history of policymaking.

The rise of these technocrats is overshadowed by a controversy that has hitherto remained unresolved. Few observers charged these economists, popularly dubbed "the Berkeley Mafia," as discreetly implicated in the PKI massacre. Such an allegation resonates with an historical context marked by the expansion of the United States' interest in Southeast Asia.[9] During the 1950s, the United States was wary that Indonesia was leaning towards the communist bloc despite Sukarno's commitment to the Non-aligned Movement. Through the role of private foundations such as the Ford Foundation and Rockefeller Foundation, the United States funded UI economists through graduate degree programs in American universities.[10] Educated with capitalist-oriented economics, these economists were seen as a special group prepared by the United States to grab the opportunity of influencing the preliminary stages of Indonesian economic development to serve American interests.[11] Later it became a reality as the economists were directly engaged in the planning of the Indonesian economy after the New Order era came to power, thanks to support from the United States and its allies. Several researchers are inclined to believe that the wipeout of the communists and the phenomenal appearance of the economists were not mutually exclusive. Indonesia's sudden shift toward capitalism and the massive flows of investments to Indonesia from abroad, mostly American corporations, after Suharto implemented a package of economic reforms conceived and implemented by Widjojo's group are referred to as hard evidence that confirms the plausible complicity of these economists in the American-planned agenda to steer Indonesia away from communism, resulting in the PKI massacre.

Whether or not Widjojo and his colleagues should be held responsible for the 1965–66 mass slaughters is not the main interest of this chapter. More relevant is the meaning behind the sheer brutality that gave rise to the New Order and

how it was legitimized through technocratic means. While the New Order's political stability was made possible by the ability of the state to terrorize the entire population by resorting to both physical and symbolic violence, or to use Heryanto's term "state terrorism," its legitimacy grew out of the ability to employ technocratic knowledge in the pursuit of socio-economic orders leading to development. Although the New Order never openly discussed the history of the 1965–66 killings with the public, the historical texts propagated by the regime's intellectual minds ubiquitously indicate that the purge of the Indonesian communists was profoundly necessary and justifiable. In the eyes of New Order proponents, it was not carried out solely to get rid of its imminent foes, but also to reach a brighter future of the country. The horrific events were seen as the *sine qua non* of a new era underpinned by rational policymaking and problem-solving programs. It is this particular strategic purpose, I would like to emphasize, which connects the violent beginning of the New Order to technocracy in Indonesia's political economy. Thus, rather than investigating how the so-called Berkeley Mafia played a role in the conspiracy that brought about awful tragedies in the mid-1960s, it is more significant for the purpose of this chapter to interpret ideological interconnections between technocracy and the history of violence, which appear to characterize the New Order; both are two sides of a coin that reinforce one another. There are two points I would like to stress in this light. First, the entry of the group of technocrats in the New Order administration marks the beginning of the formation of a new type of state never seen before in post-independence Indonesia. The New Order state is the first to adopt scientific knowledge in policymaking. Technocratic rationality thus constituted the logic that by and large guided how the New Order state made economic decisions. Second, by serving the state in pursuing its interests, one of technocracy's main goals was to transform the image and capacity of the state, incredibly plagued by a history of bloody violence, into the foundation of modernity materialized through techno-economic progress. I will elaborate these arguments later in this chapter. The bottom line is that the striking presence of technocracy since the early period of the New Order authoritarianism was meant to the create socio-economic order necessary for the accumulation of legitimacy for the newborn regime: that is, technocracy came to vindicate the New Order's past and future violence and simultaneously relied on this very violence to accomplish its agendas.

Disciplinary power

The New Order authoritarianism may seem like a classic example of a personal rule ubiquitous in many Third World countries. The shape of its power structure resembles a pyramid with President Suharto at the pinnacle (Liddle 1996). A little ripple at the top would produce big political effects at the bottom. Yet, power effects need a structural medium to resonate down to the lowest level of society. It is this very structure that underpinned the resilience of the New Order for over three decades. This structure of power can be broken down into three

inextricably intertwined instruments, each bearing a specific purpose respectively, namely coercion, electoral legitimacy, and ideological reinforcement.

The first instrument that remarkably characterized the New Order authoritarianism, for which many analysts describe Suharto's Indonesia as a heavily military regime, was the Indonesian Armed Forces (ABRI, now TNI). The distinctiveness of ABRI in comparison to those of the countries ruled by military power lies in two underlying doctrines. In the view of the military leaders, ABRI was more than a defense apparatus of the state.[12] Born out of the struggle for independence, the first generation of ABRI leaders shared a conviction that ABRI and the people were two-in-one—encapsulated in the phrase "*kemanunggalan ABRI dan rakyat*"—and that it was destined to carry out a mission of saving the nation from potential dangers, most notably the attack from the communists. This historical interpretation led ABRI to encroach unwaveringly on civilian affairs legalized by the concept *dwifungsi* (dual function), which asserts the double role of ABRI both in defense and in socio-political domains. Originating from a response to the PKI's growing power during the Sukarno era, *dwifungsi* was legally adopted by the New Order in 1982.[13] It resulted in the seizing by ABRI officers of non-military-related positions in Suharto's administrations. ABRI also attained unrivaled privileges in the legislative body by securing free seats in the parliament without participating in elections. Complementing ABRI's social and political roles was the policing function. Under the doctrine "Territorial Warfare," ABRI practically militarized the entire Indonesian geography. The doctrine is embodied in a network of territorial units that spans from the provincial level (Kodam) down to the sub-district level (Koramil), paralleling the civilian administration.[14] With the provision of an extensive role and a structural imposition upon the society, the ultimate goal of ABRI was to ensure a complete control of the entire population. Ultimately, ABRI served as a coercive instrument that aimed to eliminate any possible emergence of civil disobedience against Suharto's leadership.

The second instrument that propped up the longevity of the New Order's power was Golkar, or *Golongan Karya* (Functionary Group). Historically, Golkar was Sukarno's brainchild and was later institutionalized through *Sekber Golkar* (the Joint Secretariat of Functionary Groups), formed by a group of military officers in 1964 to counter the growing influence of the PKI on the Sukarno government (see Reeve 1985). After the New Order began development programs, its leaders were aware that electoral legitimacy was inevitably necessary to sustain and perpetuate its power. Golkar was then turned into the state ruling party with membership predominantly filled by military officials and bureaucrats. From its first elections in 1971 until Suharto's departure in 1998, it always achieved electoral victory. Two cunning policies allowed the continuous triumph of Golkar in electoral competitions, nationally and locally. The New Order unilaterally fused nine political parties into two, the Islamic-oriented United Development Party (PPP) and the secularist and nationalist-oriented Indonesian Democratic Party (PDI).[15] This came with the introduction of the floating mass concept, which refrained people at the grassroots level from joining political

parties. While the floating mass policy curbed the two political parties' ability from reaching out to constituents, it had no effects on Golkar, which was not considered by the New Order exponents as a political party, but rather an organization comprising representatives from various social groups. Not surprisingly, with this extended access to the grassroots level Golkar was able to outdo PPP and PDI in every election from the 1970s to the 1990s. Tapping onto the structure of government bureaucracy, Golkar maintained its presence virtually in every village across the country. Golkar's dominion was further reinforced by *kuningisasi* (yellowization), a term referring to the spread of Golkar's influence within the entire bureaucratic structure in which most of public officials were recruited as Golkar cadres. Golkar's victories in six consecutive elections enabled the New Order to gain political legitimacy through pseudo-democracy for such a long period of time.

Coercion and electoral politics would not have been effective without a set of institutionalized ideas to justify the presence of an authoritarian rule. It is in this light that it is imperative to examine how the New Order laid the ideological foundation upon which the whole system of power and domination that the regime had built was rationalized. As Suharto once defined it, the New Order was a system of governing, which sought to establish an orderly society founded upon the Pancasila. Given the magnitude of its political effects, it is necessary to discuss how Pancasila was discursively constructed and embedded in the New Order's imagined modernity resulting in authoritarianism.

A sort of communitarian ideology, Pancasila affirms five pillars: the belief in one God, humanity, nationalism, democracy, and social justice. Sukarno first proposed the concept of Pancasila in his speech at a meeting of the Investigating Committee for Preparatory Work for Indonesian Independence (BPUPKI) on 1 June 1945. It was brought up as a way to reconcile ideological rivalries between the Muslim modernists who demanded an Islamic state and the nationalists who insisted upon a secular state. After the obliteration of communism in 1966, the New Order fully adopted Pancasila as the sole ideology of the state and obliged all mass organizations and political parties to follow suit. In the hands of Suharto, Pancasila was further reified to an extent that it appeared to bear a mystical power encapsulated in the term "Kesaktian Pancasila." The New Order commemorated *Hari Kesaktian Pancasila* (The Pancasila Might Day) on 1 October every year. It is the day when Suharto successfully put down the G30S movement, which was depicted in school history books as the heroic action Suharto swiftly took to protect Indonesia from the communist threat. Kesaktian Pancasila renders the event of 1 October 1965 as historically predetermined rather than historically contingent, demonstrating the power embodied in Pancasila as the national ideology. Suharto regarded Pancasila as the only source of truth and "whoever and whichever group attempting to replace it will end up in their own destruction."[16] Strongly stressed as the most "valid" knowledge, the New Order claimed to maintain the purity of Pancasila from getting contaminated by conflicting ideologies, in particular communism, which were rendered as "illicit" knowledge. This necessitated the regime to screen out any

"anti-Pancasila" viruses possibly infecting the society. Here lies the source of authoritarianism of the New Order as it granted the state apparatuses the full authority to arbitrarily draw the lines between Pancasila and "anti-Pancasila"; a typical exercise of individual control that Michel Foucault terms as "the binary division and branding." Being the sole authority in defining and interpreting Pancasila, the New Order sanctified Pancasila to the extent that it became an adjective broadly attached to any social and material forms, from Pancasila Economics, Pancasila Industrial Relationships, Pancasila Mosque, to Pancasila Democracy. The latter is a "mutated" democratic system that eliminates the practice of opposition, for it was, Suharto adamantly believed, not suitable for Indonesian views.

A more crucial role Pancasila played in solidifying the grounds for legitimacy of the New Order was its teleological function, which provided a framework to imagine Indonesia as a modern society imbued by strong local values. In this post-colonial imagination, Pancasila arose as a "regime of truth" for which the New Order employed meticulous instruments to generate collective obedience indispensable to pave the path towards the ideal society. This displays the core of the New Order's authoritarianism that lies in the practice of discipline. As Michel Foucault explains, discipline is a "form of domination," which "makes possible the meticulous control of the operations of the body, which assures the constant subjection of its forces and imposes upon them a relation of docility-utility" (Foucault 1995: 137). Foucault further elaborates discipline as "type of power, a modality for its exercise, comprising a whole set of instruments, techniques, procedures, levels of application, target; it is a 'physics' or an 'anatomy' of power, a technology." Foucault's analytical concept of discipline is useful to unpack the power structure the New Order constructed in the discourse of Pancasila. Seeing the New Order from this vantage point allows one to define it as a disciplinary regime established to produce "docile" bodies with Pancasila injected to their soul and mind. This is clearly hinted in Suharto's words: "Because Pancasila is our worldview, it has become the guidance of the goal of the Indonesian nation; it becomes a source of social order and all aspects of our life, both as individuals and groups."

There were three interwoven techniques of discipline extensively developed and utilized by the New Order to accomplish its ideological goals. Panopticism constitutes the first method, which according to Foucault, refers to "a machine for dissociating the see/being seen dyad," producing "homogenous effect of power." This distinguishes the New Order state as the one who sees without being seen from the whole Indonesian population as those who are totally seen, without ever seeing. The New Order's panoptic machine consisted of several institutions arranged in certain ways whose ultimate goal was, to paraphrase Foucault, "to increase the docility and the utility of all the elements of the [New Order authoritarian] system." ABRI was made the chief instrument of the New Order's panopticism that carried out two interwoven functions: coercion and surveillance. Coercive methods relied on the use of killing and torturing machines that constantly operated to eliminate any uprising, disorder, and recalcitrant

behaviors against Jakarta. As discussed earlier, the very beginning of the New Order saw systematic coercive actions in the PKI massacre during 1965–66 that brutally purged the communists from the Indonesian land. These coercive actions continued in later years coordinated by ABRI officers. The surveillance technologies were even more pervasive as they were embedded in ABRI's nation-wide territorial units. Acting as the central surveillance organizations were the Operational Command for the Restoration of Security and Order (KOPKAMTIB)—later known as the Coordinating Agency for National Stability (BAKORSTANAS)—and the National Intelligence Agency (BIN). Via these panoptic agencies, the New Order continuously performed systematic surveillance and organized violence against student activists, labor unions, and other pro-democracy groups that indicated seemingly subversive demeanors.

Side by side with panopticism was the dissemination of uniformed knowledge that was implanted in the mind of individuals through what was officially denominated as the P4; the abbreviation of *Pedoman Penghayatan dan Pengamalan Pancasila* (Guidelines of the Learning and Implementation of Pancasila). Filled by the New Order's rigid interpretation of the Pancasila values, the P4 offered a concrete guide of how to manifest Pancasila in people's daily lives. In 1978, the People's Consultative Assembly (MPR) officially stipulated the P4 as the only "objective" reading of Pancasila. Later, the P4 was transformed into a pedagogical instrument that was materialized and taught through *penataran* (course), or in Foucault's term, the "correct training." This short course was made obligatory by the New Order government for first-year students of middle schools, high schools, and colleges. It was strictly mandatory to all civil servants working for government agencies. Utilizing such a mechanism, the New Order sought to ascertain that every educated citizen attended the P4 courses. While the panoptic technique was a means to cope with those who were deemed "insane," the goal of the P4 course was to inject the "sanity" into the mind of individuals, transforming them into Pancasila citizens. Thus, *penataran* functioned as special training through which every Indonesian purifies his or her mind from "forbidden" knowledge. Through the P4, the New Order produced Pancasila individuals who were loyal to the sacred ideology and submissive to the dominant regime's rules.

Finally, the New Order discipline was also shaped through the production of fear. This was the New Order's most imaginative technique, a dissemination of fear revolving around the discourse of *bahaya laten* (latent danger) that generated a vivid image in public consciousness of communism as a lurking force traversing in society. Such manufactured fear suggested that only the state was able to locate the communists, and the people had no choice other than trust the state to undertake pre-emptive measures to protect them even though it came at the expense of public freedom. This logic compelled the people to blindly submit their consent to the state, which consequently empowered the state to exercise domination over civil society. The discourse of latent danger appeared not only in verbal forms. The "reality" of latent danger was constructed astonishingly through the visual images of "*Pengkhianatan G30S/PKI*" (Treachery of

September 30 Movement/Indonesian Communist Party), a three-hour long movie produced by the State Center for Film Production (PPFN).[17] Based on the "true story" version of Suharto, the movie illustrated in minute detail the subsequent events in the September 30 Movement, the individuals involved, and how Suharto played a patriotic role in responding to the ensuing crisis. What renders *Pengkhianatan* a sort of disciplinary mechanism lies in how it was made obligatory for every Indonesian to see. Unlike typical propaganda movies, *Pengkhianatan* made a huge success in evoking acute communist phobia to most Indonesians due to extraordinary visual effects that lucidly demonstrate in a gruesome style the perceived cunning, violence, and cruelty of the PKI.[18] The clear message from *Pengkhianatan* was that the latent danger of PKI was utterly real. Ironically, the narrative that derived from this movie was that the specter of communism seemed more alive than Pancasila itself.

One may find an irony in the New Order disciplinary project. While it succeeded in disciplining nearly all of society, it failed to discipline and transform the Indonesian state into a modern institution. For years, the state from top to bottom was plagued by problems of corruption, lack of accountability, and poor public services, which indicated undisciplined behaviors. Despite these problems, scrutinizing the three disciplinary techniques explicated above yields a new interpretation as to how the New Order's power was discursively and institutionally assembled in intricate ways. It suggests that what Indonesian people went through during the New Order period was a new cultural episode in modern Indonesia. It is cultural because the disciplinary techniques were a new type of power, producing far-reaching implications that directly affected the daily lives of Indonesians under an authoritarian politics. However, any analytical conclusion seems unsatisfactory if it defines the ultimate goal of the New Order's disciplinary institutions as accumulation of power. I would like to argue that power in this particular context is not an end but a means to accomplish a set of goals. And this set of goals lies in the political economy of capitalist production that was systematically structured by a technocratic force. Once again, what Foucault has explained about the functions of discipline in modern society remains relevant to illuminate the New Order's disciplinary power and teleology of modernity. Foucault wrote, "The growth of a capitalist economy gave rise to the specific modality of disciplinary power, whose general formulas, technique of submitting forces and bodies, in short, 'political economy,' could be operated in the most diverse political regimes, apparatuses or institutions" (1995: 221). The rise of capitalist economy in Indonesia appeared to be the main factor to which disciplinary power was dedicated. This argument may not seem completely new, as several scholars of political economy have pointed to the apparent connections between capital formation and the state's proclivities of violence in the New Order era. My take on this matter, however, is slightly different. The expansion of global capitalism in Indonesia in the wake of the New Order authoritarianism may have prompted the state to take necessary measures to create welcoming environments for capital to breed. Yet, we need to delve deeper. At the core of capitalist production lies a certain form of knowledge,

namely technocratic knowledge, which defines the ways in which social and political energy are systematically arranged so as to result in efficient and productive outputs. Thus, while discipline facilitates the whole process "for assuring the ordering of human multiplicities," technocracy dictates this disciplinary power for the benefits of the whole regime. It is this form of scientific knowledge that constituted the main logic driving the New Order state.

Technocratic force

A wide range of observations on the New Order politics seem to share one noticeable trait: the overt presence of military power has been firmly regarded as the characteristic of the Suharto authoritarianism. The fact that Suharto originated from the military institution and that the bulk of state resources allocations were drawn by the military's interests adds to the conviction that the New Order was inherently a military regime. Overemphasis on the role of the military, however, may gloss over another element significantly defining the New Order as a byproduct of Cold War politics. As I argue in the preceding section, it is conceptually possible to construe the New Order as a disciplinary regime that aimed to produce subjects suitable for modernization. The materialization of such discipline was indeed facilitated by the military infrastructure. Yet, the determination of how discipline ought to be directed came from technocracy. In this light I argue that the New Order is more properly defined as a technocratic regime propped up by military power. As a matter of fact, what diagnostically distinguishes the New Order from its predecessor is not found in the role played by the military but in the unprecedented engagement of the technocrats who ascended as a new type of elite group taking control over national policymaking. This phenomenon had not been seen before as the domain of policymaking during the Sukarno era was left mostly in the hands of politically affiliated bureaucrats, not those who were specifically trained to fashion public decisions in a technocratic manner. Thus the formation of the New Order state at the early stage took place along the integration process of technocracy, a process that formed Indonesian political economy from 1966 and afterwards.

It should be noted that technocracy in the New Order was by no means monolithic. By this I mean the logic and rationality upon which strategic national policies were conceived had tended to be divergent rather than convergent. This was caused primarily by uneasy co-existence and apparent rivalry of two groups of technocrats that equally sought to influence the direction and strategies of the New Order's economic development and industrialization. Widjojo Nitisastro and his entourage at the UI constitute the first group, which, as briefly noted above, arose in influence immediately after Suharto officially took power from Sukarno. The other one is the engineers group led by Baharuddin Jusuf Habibie, the central figure in the formation of the technological state, which is the central theme of this book. The political and epistemological clashes between the two technocratic teams will be elaborated in detail in Chapter 3. For now I shall

focus on the economist group, which had arrived earlier than the engineers to shape the settings of the New Order political economy. Two conjunction factors, one personal, the other historical, have appeared to give the Widjojo group the opportunity to inject its epistemological ingredients into many of Suharto's crucial decisions when embarking on Western-prescribed developmental programs. One may speculate that had Widjojo never taught at the Army Staff and Command School (SESKOAD), a nerve center of the Indonesian Army in Bandung, the inception of the New Order economy would have been different. This is where Widjojo and Suharto became acquainted.[19] A few years before the G30S movement, Suharto, who then attended a leadership course at SESKOAD, was fascinated by the lectures Widjojo and his colleagues gave on economic development. This series of lectures was by no means coincidental. The head of SESKOAD, Colonel Suwarto, had invited the young economists from the UI to educate ABRI high officers on non-communist economic principles. Being the main opponent of the PKI during the height of communism in Indonesia motivated ABRI to search for alternative economic paradigms that could balance the dominant influences of the communist ideology in the state economic planning. The dawn of the New Order in Indonesian politics, not surprisingly, gave rise to the Widjojo group, which became an intimate partner of the military elite in carrying out fundamental transformations towards economic development. On a broader scale, a historical force unleashed by the proliferation of the Cold War to Southeast Asia helped to form the coalition between ABRI and the economic technocrats as the latter's paradigm appeared to be the best option for the newborn regime to undertake. As a result, what Widjojo offered to remedy the whole economy remained uncontested. The personal and historical reasons inevitably set a firm alliance between the technocrats and the military. While ABRI was tasked to create favorable environments for developmental transformations by way of social and political stability forged through disciplinary approaches, the economists was given authority to control the core economic instruments of the state and to design a new institutional structure by resorting to the scientific rationality of modern economics.

After Sukarno was forced to leave in 1966, the Suharto government took no time to realize it had inherited an economy almost in complete collapse. Economic growth was practically zero, while inflation reached an extremely high point, exceeding 500 percent. As Indonesia never made substantial economic progress since independence, 65 percent of the population lived in absolute poverty.[20] Faced with these grim circumstances, following his inauguration as Acting President, Suharto soon appointed Widjojo and his group to fill the Expert Team for Economic and Financial Affairs, bearing the mission to restore the paralyzed economy. This marks the starting point of decades-long loyal service by these leading economists to the New Order leader. Having been marginalized by Sukarno and now gaining strong political support from Suharto, the economists plausibly felt determined to have a chance to apply their market-driven economics in the real world. It was a precious opportunity every trained economist longs for, an incredible moment through which the economists

devised a set of theory-drawn instruments to intervene in the economic system. In simpler words, the future of Indonesian economy had been laid in the economists' hands.

The economic technocrats immediately asserted their authority in the economic domain by stressing the axiom widely praised among market-minded economists that economy and politics, although often intertwined, are two different matters. As Widjojo argued, "the way to tackle economic problems ought to be based on rational and realistic principles"; political and ideological biases should not command economic decision-making because they only bring damaging effects into the workings of a rationally planned economy.[21] Thus, what Widjojo and his fellow economists at UI first emphasized in their proposal was to caution Suharto to keep the economy from political interventions. Although Suharto in reality never fully complied with such a suggestion, a large majority of crucial decisions in the economy during that moment accommodated Widjojo's terms in which scientific calculations outweighed political interests. This was vividly exhibited in the series of policies the Widjojo team designed in haste during the first few years of their tenure in the Suharto cabinet. The objective was simply to stop the Indonesian economy from deteriorating further. To release the economy from unnecessary political and ideological pressures, the Widjojo team without any hesitation exercised its authority to abandon altogether economic prescriptions of the Guided Economy the 'Old Order' regime had installed for a few years and replaced them with new market economy principles with an unusual emphasis on rational and efficient methods of decision-making.[22] To facilitate the building of the market economy, the Widjojo team set fiscal flows free from government control. While the military functioned to discipline the entire society in order to establish social and political stability, simultaneously the technocrats disciplined the economy by taking such measures as balancing the state budget, controlling money supply, and reorganizing financial institutions, all undertaken with meticulous calculations. This included the restructuring of government debts that went deeply uncontrolled during the Sukarno period due to excessive military expenditures. Of utmost importance was the controversial decision to open the Indonesian economy to foreign investment, a policy that would be considered violating the sense of nationalism by the Sukarno regime. The process of slowly liberalizing the economy inevitably prompted Widjojo and his colleagues to work with transnational financial institutions, most notably the International Monetary Fund (IMF), the Asian Development Bank, and the World Bank. This led to a host of groundbreaking policies that were made official in a 1966 MPR decree known as the Regulation of 3 October, which Widjojo described as a correction to the past abuse of placing political interests over economic planning. Bolstered by sustained political stability and unfettered flows of large-scale foreign investments (particularly in natural resources exploitation such as oil, gas, and mining), it came no surprise to many analysts that these policies worked so impressively and that within just two years the Indonesian economy began to achieve growth of 10.9 percent, marking the beginning of the recovery phase.

Getting the economy back on track was not the ultimate goal Widjojo and his fellow economists were determined to accomplish. Rather, they aimed at a more substantial agenda, which was to build the foundation for a modern economic system able to bring about socio-economic transformations in Indonesian society. This strategic task signifies the significant role the UI economists played in the early process of the New Order economic modernization. Soon after devising the instruments for economic recoveries, the Widjojo team took over the Agency for National Development Planning (BAPPENAS). Previously named the Council for National Planning, BAPPENAS was the central institution that assumed a wide-span control over macro planning and was the venue where Widjojo's technocratic team carefully formulated the phases of gradual economic transformations officially termed the Five-Year Development Plan (*Rencana Pembangunan Lima Tahun*, Repelita). The attempt to set the future in successive stages strikingly reflects the form of technocratic rationality that preoccupied the New Order authoritarianism during its heyday. In 1969, the New Order started Repelita I with a concentration on infrastructure and agriculture. The New Order's Trilogy of Development—stability, growth, and equality—was introduced to the public as the key norms guiding development, though the third in the trilogy seemed to be underplayed in reality. Entering the 1970s, economic growth picked up when international petroleum prices quadrupled, owing to the Arab–Israeli War. Such a blessing in disguise conferred a massive windfall in revenue gains on the Indonesian economy up to the end of Repelita II. As oil prices went down in the mid-1980s, a shift of focus from agricultural sectors to industrial ones began to characterize Repelita III, emphasizing the production of non-oil export commodities. At the dawn of 1990s, the outlook for the Indonesian economy had completely changed from that of the 1960s. Left with a severely weakened economy, the New Order had successfully turned Indonesia's undeveloped economy into a rapidly developing economy, standing on modern fundamentals. From the end of the 1960s to the mid-1990s, average annual economic growth stood at 6.5 percent, thus tripling income per capita in just one generation. After years of being one of the world's largest rice importers, Indonesia reached self-sufficiency in rice production in the mid-1980s, an achievement the New Order often took pride in. By 1991, the contribution of industrial sectors to GDP had increased by three times, exceeding that of agricultural products, changing Indonesia's status to a semi-industrialized country according to the United Nations International Development Organization's (UNIDO) categorization. Such progress came along with impressive developments in social life. Only 10 percent of the population now lived under the poverty line, while the percentage of illiterate people stood at 18.9 percent of the population, compared with 68.1 percent in the 1960s. Amazed by these enormous achievements, many foreign economists and international development institutions praised Indonesia as one of the most influential economies in the world; an optimistic view that lasted until the Asian monetary crises wiped it out.

It should be noted, however, that behind the astonishing statistics of the New Order's economic progress lurked bitter realities.[23] Much praised achievements

of the New Order development were nevertheless tainted by some recognizable flaws as a sort of unintended consequence resulting from the structural variables within the New Order political economy. Among the problems was the staggering increase in foreign debt. This enormous rise was indeed balanced by the government's upgraded ability to serve the repayment, but the New Order government showed no serious commitment to substantially minimizing the dependence on such debt, placing the Indonesian economy at risk of intervention by its creditors.[24] Furthermore, while so much emphasis was placed on economic growth, social equality seemed to have been neglected. About 70 percent of wealth went to a very small group of businessmen, mostly Chinese-Indonesian, close to Suharto and his family. This had inevitably widened social and economic gaps, drawing out social envy between the poor and the rich, and between the "natives" and Chinese descendants.[25] Similar inequality issues also loomed at regional levels in that a vast majority of development was concentrated in Java, leaving the rest of Indonesia, most notably the eastern part, considerably undeveloped.[26] Thus, despite the ability of the New Order in structurally altering the economic foundation of the country, Indonesian society remained deeply divided along class, ethnic, and regional lines. All these failing indicators had been held responsible by some analysts for why Indonesia appeared so vulnerable to social and economic turbulences after the 1997–98 Asian crisis struck the country.

Regardless of the aforementioned shortcomings, the New Order's development is by and large an astounding story of rapid development in Asia and the contribution of the Widjojo team to the whole process of social and economic changes taking place during the New Order era is undeniably enormous. The impressive ability of the New Order technocrats to elevate the status of the largest economy in Southeast Asia has been attributed by a number of scholars to the external forces that came to shape Indonesian political economy during this period. In assessing the development carried out by the New Order regime, it is worth discussing as to where the Indonesian model of development originated. Scholars usually refer to the global influences of Western superpowers, most notably the United States, as the primary sources of developmental model implemented by Suharto. Bradley Simpson (2010), for instance, reveals in great detail the role the United States played through its foreign policies on Indonesia during the mid-1960s that allowed the UI economists to set the grounds for the New Order economic stability. Indeed, the interests of the United States in Indonesia, much like its interests in other developing countries, were evidently pivotal for the shift from an inward-looking paradigm to a market-oriented economy. Yet, an overstressed view on how the United States imposed agendas on Indonesia and largely dictated the economic model the New Order technocrats materialized reduces Widjojo, Salim, Wardhana, *et al.* to puppet-like characters driven by exogenous interests rather than by domestic dynamics and self motivations. I suggest tracing back the origins of the model of Indonesian development not from political economy per se but from the epistemological roots where the technocrats' economic rationality lies. At a glance the formulation of the Indonesian model appears to follow what an American economist and staunch proponent of modernization, Walt W. Rostow, had posited on the

stages of growth, and an indirect link could be established between the New Order's technocratic model of development and Rostow's modernization theory, which is also common in rapidly developing Southeast Asian economies such as Singapore and Malaysia. Albeit the similarities one easily identifies in Rostow's stages of growth and the New Order gradual industrialization, the New Order's development model did not completely comply with American prescriptions in terms of the state-economy relations. Best-selling author Naomi Klein (2008) mistakenly equates the Widjojo group with "the Chicago Boys," a squad of Latin American economists who brutally applied Milton Friedman's economic liberalism and market fundamentalism in countries such as Chile, Argentina, Uruguay, and Brazil. Contrary to what Klein and other authors think,[27] the model the Widjojo team conceived for Indonesian economy drew on neo-Keynesian insights, which are strictly diametrical to Friedman's free-market prescriptions. As Emil Salim revealed in an interview, Widjojo and his colleagues had long been inspired by the economic thoughts of Arthur Lewis, a prominent development economist who applied Keynes' ideas to solve problems of the developing world. After completing undergraduate degrees, Widjojo and his fellows wanted to study at London School of Economics where Lewis was a faculty member but the funding brought them instead to California.[28] Such an orientation was part of the history of economic thought that unfolded in the UI throughout the 1950s and continued to direct Widjojo and his fellows until they had the opportunity to materialize it in the New Order period. Thus, the foundation of the New Order economic system was laid in a distinctive model that eschewed, Widjojo clearly wrote, two forms of too totalizing system. On one hand is "the free-fight liberalism that leads to human exploitation" exemplified in the American model; on the other is "statism in which the state's full control tends to curtail economic potentials of non-state actors," a model strongly practiced in the Soviet Union.[29] This implies that the New Order took the middle way, which combined elements from, while avoiding the negative consequences of, both models. In the middle way, the state plays an active role in managing strategic public sectors such as food production, basic education, public infrastructure, and population control. Yet at the same time it takes advantage of markets that can presumably deliver public goods in an efficient manner. Emil Salim describes this approach as "economic planning through the markets,"[30] which constituted the main mechanism around which Indonesian development was organized. In conclusion, what the economists essentially contributed using their technocratic knowledge to the New Order was the formation of the developmental state, which had a lot in common with the East Asian model. This developmental state was gradually formed from the late 1960s to the mid-1980s before it shifted to the technological state.

Accelerated transformation

The arrival of another group of technocrats who joined the New Order administration much later than when the economists laid the foundation of the developmental state created a watershed in the Indonesian developmental trajectory. This group

consisted of several engineers who spent years of training and work in Europe during the 1950s and 1960s. A prominent figure among these professional engineers is Bacharuddin Jusuf Habibie; among his fellows were Harsono Djuned Pusponegoro, Surasno Paramajuda, Rahardi Ramelan, Sutadi Suparlan, Wardiman Djojonegoro, and Djermani Sandjaja. Having different academic and professional backgrounds, the engineers introduced a new type of technocratic knowledge different from that of the economists. Consequently, the ways they construed developmental process and the relationship between the state and the economy conflicted with the developmental approach the Widjojo team prescribed and inscribed in the New Order state. The contrast in epistemological and policy approach between the engineers and the economists will be elaborated in Chapter 3. What is instructive to discuss here is how the engagement of the engineers in the New Order decision-making politics switched the direction of the New Order development, setting the grounds for formation of the technological state.

The entry of Habibie's team of engineers into the New Order government was not the single determinant shaping the shift in the regime's developmental logic. Besides distinct power relations constructed in the reciprocal connection between the engineers and key leading actors of the New Order (see Chapter 2), there were pre-existing factors deeply rooted in the imagined modernity of the regime that provided the fertile ground for the engineers' technocratic ideas to flourish and to transform the structure of the New Order political economy. From the outset, technology indeed had become the crux of development and modernization that the New Order wished to usher in to the archipelago. Since Repelita I, the New Order government had initiated a plethora of technology utilization programs meant to exploit Indonesia's naturally endowed lands. Agricultural mechanization and engineered crops were extensively used through the "Green Revolution" to enhance farmers' capability to boost food production. Harnessing the mapping and processing technology, forests were converted into timber industry, turning the earth's lungs into lucrative dollar makers. At the same time, gigantic dams and power plants were built to generate a massive amount of electricity indispensable for robust industrialization. A satellite was also constructed to reach out across the wide span of Indonesian geography from space, literally integrating the archipelago through telecommunication. Subterranean levels did also not remain untouched. Excavators and drill strings were operated to mine minerals scattered throughout the archipelago: from the oil and gas-abundant lands of Sumatera and Java, to the gold-rich mountains of West Papua. Factories equipped with industrial machineries were erected here and there, taking advantage of plentiful cheap labor, to produce a myriad of manufactured goods. Even the human body was subject to technological interference. With the use of birth control devices, sex was "regulated" by the state through the Family Plan Program. The entire conquest of nature and body was ultimately expressed in the array of physical edifices, concentrated mostly in Jakarta, the metropolitan capital that symbolizes the material achievements of the New Order development project. Smoothly paved highways with locally assembled cars running on them, glass walls of steel skyscrapers, beautiful monuments eliciting moments of enjoyment, and sparkling colorful lights on streets all celebrated the coming era of a

modern Indonesia. What the New Order did to alter the cultural and natural landscape of Indonesia was spurred by a technological imagination that reflects narratives of a post-colonial modernity. Such narratives, as developmental anthropologists have generally discussed (e.g., Gupta 1998; von Barloewen 1995; and Venn 2006), are ubiquitous in developing societies. Ever since modernization was imposed by Western superpowers on post-colonial states, it has been tightly associated with modern technology in that progress is measured primarily by advances in the development and application of various forms of technical systems such as telecommunication, railroads, highways, electricity, and so forth. This definition of modernity as such creates a cultural milieu favorable for technology-minded ideas to appear so appealing and attractive to developmental regimes like the New Order that they became the chief driver of changes. When Indonesia began to enjoy growth and stability in the late 1960s, it took no time for such a discourse to turn into an ideology and became inextricably intertwined with authoritarian politics, fully loaded with desires to conquest the future and the endowed nature. It is this sort of amalgamation that Habibie's entourage found extremely exciting and motivating when they commenced their service for the New Order regime.

Apart from the cultural milieu being prone to technological enticement, the engineers received more opportunities to influence decisions on developmental policies from a particular idea that occupied the minds of the New Order leading figures. This powerful idea rests on the assumption that it is possible to accelerate the whole process of socio-economic transformation through concerted efforts at all levels with the state as the conductor. Ali Moertopo, one of the prominent intellectuals of the New Order who served as the personal assistant to President Suharto, first brought up this idea of accelerating modernization. In a 1972 publication by Jakarta-based Center for Strategic and International Studies (CSIS), Moertopo conveyed his thoughts on the necessity for a developing country like Indonesia to pick up the pace of modernization in order to close the gap with developed countries.[31] Moertopo highlighted acceleration of modernization as a process that demands well-informed planning undertaken by experts who are presumably able to define and design effective mechanisms for such a process to succeed. A proper technocratic arrangement was thus required to control this "artificial process." Fueled by their engineering inspiration, Habibie and his team picked up this idea and turned it into a practical concept of "accelerated transformation."

At the core of accelerated transformation lies the conviction that social transformation can be engineered in such a way to be hastened. More importantly, it is believed that this acceleration is triggered by the adoption of technology that has rationally constructed structures and forms, which push society to adapt to new environments. A few years before the engineers arrived home, Moertopo had mentioned in his essays the significance of technology as "an accelerator of modernization process." While Moertopo discussed accelerated modernization in the context of productive capacity, Habibie extends this discourse to the cultural domain encompassing not only how the state enhances productive forces in society but also the way people think and act as part of a modern society. Thus, Habibie places modernity as an end accomplished through technological means rather than as a

mere process as implied in the notion of modernization. It renders technology as having a two-fold function: as an engine of growth and an agent of change; while simultaneously making wealth, technology stimulates social and cultural movements towards modernity. This is because, Habibie believes, technology is embodied by modern values; hence, the permeation of modern technology in a post-colonial society encourages individuals to follow operational rationality that technological systems require. In a nutshell, the introduction of new technologies will initiate a motion that pulls the entire social structure to transform and to unleash its great potentials. Thinking as an engineer, Habibie asserts that accelerated transformation "is not a random process because its movement can be controlled and predicted. This means risks and costs of transformation can be managed" (Habibie 1995: 53). Those who are familiar with the STS literature will find no difficulties in detecting a sense of technological determinism as the underlying assumption for Habibie's accelerated transformation. Technological determinism is a modern ideology that rests on the belief that technology constitutes the main force driving social changes in society. Plenty of works in STS have criticized this ideological view for its fallacies.[32] More relevant to discuss briefly here is how the materialization of the concept remarkably affected the political economy of the state in Indonesia during the New Order era.

As will be illustrated throughout this book, the accelerated transformation concept brought about a shift in the New Order governmentality that gradually turned the developmental state into the technological state. This shift was signified by trends in three respects. The most immediate effect was seen in allocations of state budgets on the sectors that contained high technology components. In the mid-1970s the New Order government began to provide considerable funding to a large-scale technological program that Habibie and his engineer fellows planned and carried out. This continued to increase throughout the mid-1980s and 1990s. Most of the financial resources channeled to the expensive undertakings were drawn from oil revenues via non-budget pockets. The stable increase of spending for state-directed technology acquisitions was systematically accompanied by the establishment of a host of technology-related agencies and task forces within the New Order administration. Playing a central role was the BPPT, which exerted influences on strategic decisions, much as BAPPENAS did in conceiving of national policies. BPPT is under the jurisdiction of the Ministry of Research and Technology (RISTEK), both of which were led by Habibie for 20 years after their inception. The last aspect no less important to note is the shifted discourse of development, particularly from the beginning of the 1990s to the end of the New Order period when Habibie's high technology visions predominantly filled public discourses on development and economic policies. It should be noted, however, that despite the remarkable influences of the engineers' accelerated transformation on state policy, the market economy the economists installed in the mid-1960s remained prevalent. Although the engineers stressed the importance for the state to play a direct role in technological innovations, they did not downplay the necessity of an open economy for technology-based industrialization. This is what Habibie and Widjojo have in common, and will to be discussed at length in Chapter 3.

To conclude this chapter, one question remains. Why was the New Order deeply obsessed with accelerating socio-economic transformation in the first place? What was the driving force that rendered the discourse of accelerated transformation so powerful in switching the direction of the New Order developmental trajectory? Why did the New Order leaders decide to change lane? There is a combination of factors taken into account to reply to these questions. Emil Salim posits that after the New Order managed to recover the ruptured economy and to make substantial progress in the economic production, there emerged self-confidence within the regime to seek new challenges.[33] Such a psychological impulse was emboldened by unexpected windfall revenues from the 1970s oil bonanza, making technology-mediated accelerated transformation seemingly achievable and feasible. A more salient explanation is to be found in deeper concerns over global inequalities that the New Order architects expressed at the time. Feelings of anxiety and insecurity about the internal and surrounding circumstances due to rapid globalizing processes were strongly present despite the ability of the New Order to overcome hardships in its early periods. Again, Moertopo's writings signaled such apprehension in which he emphasized prolonged poverty as a potential threat that ought to be handled by accelerated production of welfare. He wrote, "It is the main duty of governments of developing countries to lessen the widening gap … that invariably force developing nations to accelerate its modernization."[34] The roots of this concern, it seems to imply, lie in Indonesia's underdeveloped conditions, which in the eyes of the New Order leaders were caused not only by centuries of colonialism but also by decades of stagnant growth during the Sukarno era. Thus, a sense of urgency looms out of this grim sight. It suggests that time matters a great deal and thus should not be wasted. The slower the transformation, the greater the social and economic uncertainties that will unfold. Accelerating developmental processes then appeared to be the best strategy to alleviate as quickly as possible the social ills generated by prolonged underdevelopment. The advent of high technology entered into this picture, presented by the engineering technocrats as a panacea for overcoming present malaise and also for winning the future. Without hesitation, Suharto favored the engineers' proposition as he stated in his biography: "We are compelled to make long-term preparations so as to anticipate the future where our survival is determined by the mastery of modern science and sophisticated technology."[35] Thus, the ability of the engineers to steer development and to catalyze the formation of the technological state is attributed to a strong view shared among the New Order political elite to increase the pace of development. This, however, came with unforeseen consequences, particularly when globalization forces shook up the dominion of the state. The rush to accelerate transformation caused the failure of the New Order technological state to strongly take root in the larger spectrum of political economic structures and to withstand the global crisis. Chapter 7 will further discuss how this tragic ending unfolded.

2 The general and the engineer

It is necessary to think of the political problems of intellectuals not in terms of "science" and "ideology", but in terms of "truth" and "power".

Michel Foucault

Power is a source of breath and heartbeat for every state to exist, live, and to carry on governing its citizens. This maxim unexceptionably holds for the technological state. As a political entity undertaking a mission to executing large-scale socio-technical transformations, the technological state in Indonesia was continuously fed and nurtured by a profound supply of power drawn from the authoritarian structure whose legitimacy and stability, as extensively explicated in the preceding chapter, gave the New Order regime the strength and the capacity to undertake transformative developmental changes. This chapter aims to explain how the New Order technological state owed its strong foundations to a peculiar power relationship among the elite.

When it comes to the question of power, social theories of the state, Philip Abram (1988) once noted, are replete with accounts that conceptualize the state in ways that seem to mystify and reify the underlying mechanism of the state. To avoid such shortcomings, the power dimensions to be elucidated in this chapter are situated on a level where exchanges of power between individual elites occur at the highest political positions in the regime's structure. In the context of power of the New Order authoritarianism, this analysis requires placing our gaze on two actors predominantly responsible for the formation and consolidation of the technological state. The first is Suharto, the leader of the New Order regime. Ample writings have been produced to document Suharto's political life.[1] This chapter highlights some of the crucial elements of his political thoughts and decisions that contain technological aspects. A greater portion of analysis in this chapter is placed on the second protagonist, Bacharudding Jusuf Habibie. As briefly noted in the preceding chapter, Habibie was the leading figure among the engineering technocrats who came to dominate the discourse on technology and development.

Apart from demonstrating how a distinct power configuration forged the possibility for the technological state to arise and to determine the political economy

of development in Indonesia, this chapter also seeks to complement studies in the knowledge domain of New Order politics that place enormous emphasis on Suharto, which understates the influence of "satellite" figures such as Habibie. Despite the significant role Habibie played in the New Order politics, scholars of Indonesian studies are inclined to attribute his power solely to his relationship with Suharto, rendering the New Order technological ventures as a mere result of cronyism and nepotism. This perspective assumes Habibie to have no substantial power other than what Suharto delegated to him. It may be true that Habibie profited largely from the centrality of power that Suharto held for over three decades. However, this simplified interpretation fails to capture the significance of Habibie's scientific background, and how this provided him with his own form of power, used to generate Suharto's enthusiasm and blatant support for high technology. Using the concept of symbolic power by French sociologist Pierre Bourdieu, which I will elaborate later, this chapter argues that the power relation between Suharto and Habibie was not simply uni-directional in that Habibie drew his power from Suharto's unchallenged political position. Rather, there was a sort of symbiotic mutualism between these two elites, with both actors equally influencing and interdependent. Analyzing Habibie's biography and his source of power is profoundly important because the whole modality of the technological state originated from Habibie's life experience and is embedded within this power relation. Yet, Habibie's political significance stretched beyond the technological domain. In addition to his influence on a broader spectrum of state decision-making, his strong association with Muslim modernists during the rise of political Islam in Indonesia constitutes the most surprising detour in the New Order political trajectory. The cultural analysis presented in this chapter serves as an entry point to comprehending the nature of power underpinning the New Order technological state, and sheds light on how different forms of power operated and were transacted between the leading elites and linked to the broader context of power, implicating the Muslim intellectual group. By the same token, examining the power relation centered on the New Order key individuals illuminates the source of fragility in the formation of the technological state. As this power relation was highly susceptible to political changes, it came with consequential vulnerability to the New Order technological state.

Little Rudy

B.J. Habibie was born on 25 June 1936 in the city of Parepare in South Sulawesi. His father, Alwi Abdul Jalil Habibie, was a Buginese descendant, who went to study at the agricultural university in Bogor and then worked as a public agricultural consultant in South Sulawesi. Habibie's mother, R.A. Tuti Marini Puspowardojo, was the granddaughter of a Javanese aristocrat and respected medical doctor in Semarang, Central Java. Born to the *pryayi* parents,[2] Rudy (Habibie's nickname) and his siblings lived comfortably with relatively high social status during the colonial period. Together with seven brothers and sisters, he grew up

in Parepare before Mr Jalil Habibie decided to move to Makassar, the provincial capital. Mr Jalil Habibie died from a heart attack when Rudy was 13 years old. In 1950, Habibie went to high school in Bandung, West Java. Later, his entire family followed. Feeding her children alone, Mrs Habibie started her real-estate business of rental properties and became fairly prosperous.

After finishing high school, Habibie went to the UI's Faculty of Engineering in Bandung (now *Institut Teknologi Bandung*, ITB) where he studied mechanical engineering. But ITB was just a temporary harbor. Before his sophomore year, Habibie headed for West Germany, as Mrs Jalil Habibie wanted her bright son to receive a better education abroad. In 1955, Habibie began his study in aeronautics at *Technische Hochschule Aachen*. In Europe, Habibie mingled with other Indonesian students. Because he was the only Indonesian student studying on his own financial resources, while all his Indonesian fellows lived on government scholarships, Habibie appeared rather special and increasingly popular among Indonesian students.[3] During his undergraduate years, Habibie was actively engaged in student organizations and managed to achieve the top position in the Indonesian Student Association (PPI). In July 1959, Habibie organized a seminar on development, inviting several Indonesian high-positioned bureaucrats to give key addresses. Held in Hamburg-Barsbuttel, the seminar was a success and provided a splendid opportunity for Habibie to gain access to key people in the government. Habibie also initiated a small study club whose members studied engineering fields related to aircraft production. Using PPI as the venue, they met regularly to discuss and to update their knowledge on aircraft technology. It is with this group that Habibie shared for the very first time his dream of building a modern aircraft industry in Indonesia. His colleagues were fascinated by the idea and were committed to implementing it once they all returned home.[4]

After completing his undergraduate study in 1960, Habibie went on to doctoral study at the same university. In 1962, he went back shortly to Indonesia to marry his high school sweetheart, Hasri Ainun, with whom he has two sons. In 1965, Habibie defended his doctoral thesis entitled "*Beitrage zur Temperaturbeanspruching der Orthotropen Kragscheibe*" (Contribution to the Temperature Demand for Orthotopic Collarflanges). Habibie started his industrial experience by joining the Hamburger Flugzeugbau (HFB) where he took part in the design project for Fokker's F-28 and Dornier's DO-31. A large proportion of his assignments in this company focused on conducting fundamental research on aircraft construction. As per his job description, Habibie worked most of the time in the laboratory developing core scientific formulae and theories. Some of his works were published in prestigious journals of the field. In his biography, Habibie expressed his pride of one of his inventions, which was adopted by the North Atlantic Treaty Organization (NATO) as a standard for the aircraft design.

In 1969, HFB merged with Messerschmitt–Boelkow and became Messerschmitt–Boelkow–Blohm (MBB). This change boosted Habibie's professional career as an engineer. His position was elevated and he was made responsible for the planning and supervision of a major manufacturing plant that participated in the construction of the Airbus A-300B. For this prestigious project, Habibie

formulated the crack propagation theory, a mathematical model to predict crack propagation behaviors of aircraft structures down to the atomic level. This groundbreaking invention saved a great deal of time and money in the aircraft design process and later was also applied in the construction of the Boeing 747. His tenacious work on the crack problem earned Habibie the sobriquet "Mr Crack." Due to his brilliant accomplishments for the company, in 1974 Habibie was appointed vice president and director for technology application. This was the highest position ever granted to a foreign employee in the history of MBB. Habibie kept his job at MBB until 1978, when Suharto named him the State Minister for Research and Technology.

A closer look at Habibie's life in Germany is relevant not only because this is the point where Habibie started to cultivate his cultural capital which significantly influenced the next phase of his life, but it also shaped how Habibie construed the role of high technology in the developmental process. This has to do with what German society was undergoing at that time. When Habibie arrived in Aachen in 1955, a massive reconstruction and developmental program of the economy was taking place in West Germany. Widely referred to *wirtschaftswunder* (economic miracle), it was the rapid transformation that brought about profound social and economic changes paving the path for the German industrial superiority to surge forward after the nation's bitter defeat in World War II. With full financial backing from the Marshall Plan, West Germany's social market-based economy grew quickly. From 1950 to 1960 industrial growth multiplied by 2.5 times, while the gross national product was seven times larger within only 20 years. The resurgence of German industry possibly impacted how Habibie and his Indonesian fellows construed developmental transformation. Coming from a less developed society, Habibie was impressed by the social and economic progress that improved the livelihood of the Germans. At a deeper level, he came to believe that what happened in German society during these years could serve as a model for Indonesia to attain modernity, which would usher in progress and prosperity for society at large. It was partially due to what he experienced in Germany that Habibie envisioned his concept of accelerated transformation that he sought to implement in Indonesia.[5]

Another element reflected in Habibie's interpretation of German modernity is the nationalist spirit that powerfully motivated German people to regain their dignity as a sovereign nation through industrial prowess. Habibie was aware of these nationalistic sentiments, as he had maintained his nationalist fervor despite living abroad for decades. This personal character is relevant to note since it had strongly influenced Habibie's view on the interplay between technology and nationalism. Habibie's wife noted, "While we were abroad, his patriotism kept growing. Often I could find photographs on the back of which poems had been scribbled, and these Poems were in praise of Indonesia."[6] During the early years studying in Aachen, Habibie began to view himself as an envoy dispatched to acquire Western technology for the cause of the nation. "We are destined to help the country," he once said to his friend.[7] Such a nationalistic commitment originated years back. Growing up during the revolutionary years, Habibie's

nationalism was much inspired by Indonesia's struggle for independence. Prior to leaving for Germany he had met Muhammad Yamin, a respected figure in the Indonesian independence movement who was then a minister of education. Yamin strongly urged Habibie to study aeronautics because he believed Indonesia should develop capacity in aircraft manufacturing. Habibie took Yamin's messages as a great responsibility placed on his shoulders.[8] During his tenure at MBB, Habibie hired several Indonesian engineers, all of whom were former student fellows in the PPI study club. According to Habibie, he had prepared these engineers to be an elite group of technical experts who would join him on their return home to make his dream come true.[9] Years later, these engineers became key people in technological institutions formed by the New Order regime.

Privileged technocrat

Habibie had enjoyed the accolade of the most influential technocrat of the New Order due to a unique personal history with Suharto. Habibie knew Suharto long before the general came to power. Their friendship dated back to 1950 when Suharto was dispatched by the central government in Jakarta to suppress a separatist movement in South Sulawesi. In Makassar, Suharto, then an Army Lieutenant-Colonel, led a brigade that happened to stay in a headquarters across from the Habibies' residence. Suharto quickly became acquainted to Rudy's family, especially his mother. As Suharto recounted in his biography, he felt pleasantly welcome by the Habibies and very much enjoyed chatting in Javanese with Mrs Habibie.[10] One of Suharto's subordinates in his brigade married Rudy's older sister and became the communication mediator between Habibie and Suharto during Habibie's sojourn abroad. Among the Habibies, Suharto felt closest to little Rudy, whom he found special. They became even closer after one event that shocked the Habibie family. On a fateful evening, when Rudy's father suffered a heart attack, Rudy rushed to Suharto's compound asking for help. When they came back with a doctor, it was unfortunately too late. Mr Jalil Habibie breathed for the last time on Suharto's lap. This grieving moment elicited sentimental memory for Rudy Habibie who now found a father figure in Suharto. Since then, he always looked up to Suharto, whom he deeply admired both as a friend and the New Order leader.

After completing his doctoral degree, Habibie wanted to return immediately to Indonesia. But it did not happen. He sought a job at the Aircraft Industry Preparation Command (KOPELAPIP) but was turned down for being over qualified; that small aircraft workshop was still struggling to survive (see Chapter 5). In any case, the 1965 political turmoil prompted Habibie to cancel his return. Habibie's brother-in-law mediated his communication with Suharto, who suggested he remain in Europe until the circumstances became more favorable. A sign for a return finally came up when Habibie met Ibnu Sutowo in Dusseldorf in 1973. Being the head of the state-owned oil company, Pertamina, Sutowo was one of Suharto's most trusted patrons who had great interests in high technology.

He was the man behind the construction of Krakatau Steel, one of the largest steel mills in Asia.[11] Learning what Habibie had prepared to devote his scientific skills to his country, Sutowo was deeply impressed by the engineer's credentials and ideals. As he recalled later, Sutowo saw his meeting with Habibie in Dusseldorf as an historic starting step in Indonesia's high technology adventure.[12] He then delivered Suharto's message summoning Habibie to prepare for repatriation, a call Habibie had been waiting for.

In January 1974, Habibie landed at Halim Perdana Kusumah Airport in Jakarta. This Indonesia was completely different from the one he had left. The New Order was growing stronger in power and a massive economic development was underway. With the skyrocketing of oil prices, the government was able to finance capital-intensive projects using oil revenues, which sprang from Sutowo-controlled Pertamina. Two days after arriving in Jakarta, accompanied by Sutowo, Habibie went to see Suharto in the presidential palace. After giving a warm hug to his old friend, Suharto showed Habibie a thick pile of newspapers and magazines he had collected. They contained information mainly about what Habibie had accomplished in his ten years of engineering career in Germany. Suharto told Habibie that he had learned everything about Habibie from his successful study to how he contributed to high technology development in Germany. Being straight to the point, Suharto said to Habibie, "You will have to assist me to make our national development successful. I am particularly interested in technology, and you must find the way to materialize it." Habibie replied, "But, Mr President, I only know about aircraft construction. Why would you put me in charge?" The president answered, "If you know how to build an aircraft, you sure are capable of doing other things as well." Sensing that he had been offered an opportunity he had longed for, Habibie promised Suharto to build an Indonesian-made airplane within ten years. But he seriously underlined that the plan would work only if necessary infrastructural set-up along with capital was extensively provided. To this request Sutowo stepped forward ensuring Habibie that Pertamina was more than ready to facilitate his plans. Suharto also gave his keen support but warned Habibie, "We have to bring about some reforms and changes in science and technology, but please Rudy, don't bring about any social upheavals."[13] This was no issue for Habibie who then had no interests in politics, let alone actions Suharto would consider subversive. He admitted that his main interests were high technology and development. Yet, this does not mean that Habibie was fully oblivious to politics. Trained as an engineer, Habibie knew that power is necessary for a machine to work; that is, Habibie's desire to build an aircraft industry in Indonesia was only possible with political support from Suharto. Only with the conviction that the regime leader would back his plans would Habibie be confident about his return. Yet, there was something special about how Habibie developed his personal ties with the New Order leader. He knew very well how to establish Suharto's trust by paying constant obeisance. Habibie's biography accounts such allegiance in which Habibie likened himself to an architect with Suharto as his client. As stated in his biography, "Before starting a construction, the architect should ask the principal whether the design

complies with the principal's wishes. For it would be not good to build a house, when the principal is unhappy with the design."[14] This phrase implies that the technical skill may belong to the architect, but it is the client who decides what he truly wants in the design of his house. It is translated in the manner Habibie always had to seek for suggestions and opinions from Suharto before he proceeded with his plan. A cultural dimension was also involved in the Suharto–Habibie relationship. Whether for admiration or gratification, Habibie showed great interest in Javanese philosophy and Suharto was the main source of knowledge for his learning. Not only did Habibie acquire Javanese spiritual teaching from Suharto, he also considered Suharto his guru of politics; he once called Suharto "my professor." He had a photograph of Suharto dressed in Javanese traditional custom attire hung in his office. On the picture, there wrote a Javanese aphorism stressing the balance of knowledge and spiritualism. Later it proved that Habibie's praise to Suharto resulted in a powerful leverage to his career as a technical expert, but also as an influential bureaucrat in many years to come.

After four years of employment with Pertamina in which he led the Advanced Technology Division, Habibie officially started his bureaucratic career in the New Order administration when Suharto named him the State Minister for Research and Technology in 1978. He was not the first person to occupy that position. His predecessor in the previous cabinet was Sumitro Djojohadikusumo, the Don of the UI economists. When Habibie took over the ministerial seat, he suggested that Suharto slightly change the ministry's title from the State Minister of Research. The addition of "technology" significantly marked Habibie's overt orientation towards the administrative system of the Federal Republic of Germany that Habibie sought to emulate at the time. Aside from heading the ministry, Habibie was also fully in charge of BPPT, a nerve center of technology policy and development deliberately formed to balance policy inputs from BAPPENAS, which was then controlled by the Widjojo team (see Chapter 3). He occupied these two top posts for four consecutive terms (20 years), making him the longest serving minister of the New Order government.

Yet, Habibie seemed to have capabilities more than just to handle two important positions. A startling feature of Habibie's technocratic reign is an unmatchable number of top-level governmental positions he held almost all at once. In addition to being the chairman of the National Research Council, of the National Standardization Agency, and of the Counseling Board of the Indonesian Defense Industry, Habibie was trusted by Suharto to coordinate the *Otorita Batam*, a special authority assigned to boost industrial developments on Batam Island meant to compete with the industrial supremacy of its neighbor, Singapore. Another much more strategic post Habibie occupied in the New Order administration was chair of the Agency for Strategic Industries (BPIS), a "holding company" that oversaw the operation of ten state-owned manufacturing industries, ranging from transportation, telecommunication, heavy equipment, to weaponry. Three of these strategic industries, including the aircraft manufacturer, were under direct supervision of Habibie as executive director. The

following chapter will discuss in detail the role of BPIS in the formation of the New Order technological state. What can be inferred from an astonishingly long list of high governmental assignments is that Habibie's extensive authority, which had stretched beyond technology matters, shows how much Suharto trusted his engineer aide and the worth of Habibie's technocratic knowledge to the New Order's primary agenda. Numerous strategic positions in the bureaucracy as such enabled Habibie to build a network of technology-minded bureaucrats to effectively shape the New Order as a technology-oriented developmental regime.

Symbolic power

In a patrimonial authoritarianism, proximity defines power. The closer one is to the central figure, the greater his/her power. This equation may explain how Habibie was able to secure so many top-placed bureaucratic positions by taking advantage of his close relationship with Suharto. No elite figure was closer to Suharto than Habibie, even Suharto's economic aides, Widjojo and his colleagues, who had assisted Suharto in stabilizing Indonesia's economy during the formative years of the New Order regime. However, proximity results from trust, not the other way around. Thus, one question remains: why did Suharto trust Habibie so much? A hasty observation would attribute the incredible trust Habibie enjoyed from Suharto to their close relationship from earlier times. But this may not explain the whole story. Indeed, Habibie seemed to have no particular political agenda that could threaten the continuation of Suharto's hegemonic rule, rendering Habibie to be politically innocuous. Yet, Machiavellian in nature, Suharto had an instinctive sense of whom to trust and distrust. Many politicians and presidential assistants once close to Suharto were eventually alienated from the circle of power. Hence, it is rather naïve to believe that Suharto treated Habibie trustfully just because they had a prior friendship. So what is the source of Suharto's trust in Habibie? The answer lies in a form of power Habibie cultivated as a respectable scientific expert. But before we proceed to that notion, it is instructive to discuss one particular framework commonly used to observe the cultural dimension of power in Indonesian politics.

Looking at all the unrivaled privileges Habibie enjoyed due to Suharto suggests that the pattern of power relation between Habibie and Suharto was unidirectional; Habibie's power was completely drawn from Suharto. This explanation fits what Benedict Anderson (1990) has explained concerning the concept of power in Javanese culture, an explanation widely used by scholars studying the phenomenon of power in Indonesia, particularly in the New Order. According to Anderson, power in the Javanese concept is largely distinctive in nature from that of modern European concept. As Anderson notes, the Javanese mysticism conceives power as natural force independently from social relations. Power is materialized in every dimension of natural realm and runs from generation to generation. The way Anderson describes the Javanese concept of power has been criticized but it is beyond the purpose of this chapter to address this

criticism. Yet, it remains relevant to briefly discuss here considering that New Order politics was heavily influenced by Javanese culture. Anderson's notion of the Javanese concept of power constructs a power relation such that it revolves around Suharto and places Habibie as a secondary actor receiving energy from the center. According to Anderson, the quantum of power in Javanese cosmology is constant, similar to the law of thermodynamics. Consequently, the accumulation of power in one place causes a proportional diminution elsewhere. As such, "the ultimate goal of power relation is not the exercise but the accumulation of power" (Anderson 1990: 23). This perspective of power relations entails that Habibie is originally powerless and he does not possess any real power. All real power is centrally concentrated in Suharto who does not share his power because it will reduce his own power. The implication of this view involves discounting the political influences of Habibie because he is considered highly dependent on Suharto. If the channel to Suharto was broken, hypothetically, the power of Habibie would abruptly vanish.

Anderson's description of power in the Javanese culture is appealing, but it may risk problematic over-simplification. Suharto undoubtedly controlled the spring of political energy that provided incredible effects for Habibie. Yet, Habibie did not merely reflect the radiance of power from Suharto. I would like to argue that there was a mutual power relation that was established in which Habibie and Suharto drew enormous mileage from each other. The acknowledgment of this symbiotic mutualism between the two actors permits a more nuanced explanation. An accumulation of power in Habibie does not consume the power in Suharto. Power of both accrues simultaneously as one's power enhances that of the other. In other words, the greater Habibie's power is, the greater his guru's, and vice versa. A discussion on the rise of the Indonesian Muslim Intellectual Association (ICMI) later in this chapter will support this argument as it shows how it placed Habibie at the center of political Islam in the New Order era.

How such interdependence emerged and acted as a substitute for the centralistic structure suggested in Anderson's interpretation can be understood by drawing on Pierre Bourdieu's concept of cultural capital. Challenging Marx's materialist view of power, Bourdieu (1991) offers the notion of *symbolic power*, a form of power that he argues emanates from the cultivation of cultural capital. According to Bourdieu, cultural capital is a valued resource in the production of symbolic power. Cultural capital is constituted by a wide variety of resources such as verbal facility, cultural awareness, aesthetic preferences, schooling system, and educational credentials. Focusing his research on the elite class in modern societies, Bourdieu posits that symbolic power is an effective medium for domination "only through the complicity of those who do not want to know that they are subject to it or even that they themselves exercise it" (1991: 164). Bourdieu further argues that politics is invariably attached to symbolic systems, which provide the dominant class with legitimacy by forcing the dominated to submit to the hierarchy of social distinctions. What is remarkably important in Bourdieu's formulation of cultural capital relevant to the sociology of power is

the proposition that different forms of capital are interchangeable.[15] This idea of interchange is plausibly extended to explain a transaction of cultural and political capital between Habibie and Suharto. In this process, Habibie's cultural capital was exchanged for political capital from Suharto. The New Order strongman was keen to get involved in this transaction because he was captivated by Habibie's educational and scientific credentials. Suharto's life biography as a peasant child who grew up in a poor Javanese village was responsible for urging Suharto to make exchanges with his minister of research and technology. Suharto only completed high school and never had the opportunity to attend college. In contrast, Habibie not only came from a priyayi family, he was an engineer with a doctoral degree earned from a university in an industrially advanced country. In addition, Habibie had achieved an outstanding career in a high-tech corporation overseas. This was clearly an achievement very few Indonesians, if any, could make at the time. This surplus of cultural capital became the source of symbolic power Habibie exerted on the exchange of power with Suharto.

One may ask why Suharto developed such a special exchange of power with Habibie's cultural capital but not so with Widjojo, who had accumulated similar cultural capital based on his scientific background in economics. The way in which Suharto excessively favored his engineer fellow over his economic aides puzzles many observers. In his biography, Suharto mentioned Habibie's name frequently and barely mentioned Widjojo and his economist fellows. What was so valuable about Habibie that outweighed the significance of Widjojo's contribution to the New Order? A salient factor comes from Suharto himself who was very keen on high technology. Apart from Habibie's symbolic power that greatly fascinated the New Order leader, Habibie also drew profound support from Suharto due to the passion and interests of Suharto towards high technology that he confidently regarded as the means to accelerate socio-economic transformations. In his biography, Suharto explicitly underscored the significance of science and technology: "We have to make a long-term plan to anticipate the future, which is determined more and more by our capacity in developing sophisticated science and technology."[16] Desire for technological prestige may be a common trait among authoritarian leaders but in Indonesia's New Order such desires entailed distinct political outcomes that benefited Habibie and his technocratic team. Equally important to note is that Suharto saw high technology as a way by which he could elevate his esteem and override the powerful image of his predecessor and the founding father of Indonesia, Sukarno. Suharto had been entitled *Bapak Pembangunan* (Father of Development) by his loyalists but that seemed just not enough. Besides economic wealth, he particularly wanted to establish technological supremacy as his legacy. He shared this ambition of high technology with Habibie and believed that Habibie was precisely the man he needed to build a new reputation for his regime, one that projected a modern image of Indonesia. "Only through science and technology our nation could progress," said Suharto.[17] This phrase clearly expresses Suharto's strong conviction about the indispensability of high technology to the progress of Indonesia, which

renders Habibie's cultural capital even more precious to the New Order. In turn, Suharto became dependent on Habibie to accomplish what the New Order had promised to deliver to the Indonesian people.

To comprehend how Habibie was highly worthy to Suharto, we should examine one particular affair that sparked a controversy in the mass media. It began with a letter Suharto signed on 3 September 1992. In the letter, Suharto assigned Habibie, instead of the Department of Defense, to handle the purchase of 39 used military ships from the German government. Using his channel to contact high-level bureaucrats in Germany, Habibie was able to secure a considerably lower price for the fleet than the going market rate. The purchase turned awkward when the *Tempo* magazine wrote that the budget Habibie had proposed for the project was US$1.1 billion. This seemed much higher than deemed reasonable. Habibie explained that a major proportion of the budget would be spent on modification and delivery costs.[18] This explanation did not end the controversy particularly after one of the modified ships nearly sank on its way to Indonesia due to a storm in Biscay Bay off the coast of northern Spain. Though the ship managed to reach its final destination, the incident instigated public concerns about the reliability of the fleet Habibie had purchased. Viewing this affair as an embarrassing scandal, *Tempo* published a report on 11 June 1994 that questioned the government's seemingly reckless decision to purchase the used fleet. The report stressed a lack of technical competency on the part of government officials.[19] It was quite obvious that *Tempo* was holding Habibie accountable for the issues in the purchase of the old German fleet. The allegation did not cause disaster to Habibie, but instead to *Tempo*, *Editor* and *Detik*. On 21 June 1994, Minister of Information Harmoko revoked the publishing licenses of those three national news media. Habibie made a public statement that he had nothing to do with the government's decision on *Tempo*, *Editor*, and *Detik*. The statement only implied that the decision came directly from Suharto.[20] The press suppression shown in this case was nevertheless unexpected because it ruined the open atmosphere that the New Order had recently begun to establish. Worth noting in this train of events was the way Suharto sought to defend his favorite technocrat. One may wonder as to why Suharto was willing to go so far to defend Habibie. Many of Suharto's close assistants and friends implicated in shameful scandals were let fall, but he seemingly could not afford to lose Habibie. The answer lies in the point Suharto had made:

> Whether you want it or not, if this problem [allegations about Habibie] persists, it would interfere with the political and national stability. If we cannot warn them [the media], we need to take action. Otherwise, it will threaten, and interfere with, the development, which is the center of our hope.[21]

A high tone in Suharto's words simply signaled his discontent in the trouble the media had caused to cripple the reputation of his most trusted lieutenant. More importantly, his furious reaction clearly showed how much Habibie meant to him, so precious that he considered that the media had shaken national stability. In other words, Suharto protected Habibie primarily not because Habibie was his

close friend. Rather, it has to do with the fact that Habibie possessed something that, as hinted in Suharto's warning, the New Order greatly depended upon to accomplish its developmental goal.

The interdependent power relation between Habibie and Suharto produced tremendously centrifugal effects in Indonesian politics during the 1990s. By this point, Habibie not only played his technocratic role, influencing the policies of the technological, economic, and industrial sectors, but also had entered a terrain he once considered taboo, politics. Habibie's engagement in practical politics started in 1992 after he joined Golkar as the deputy of daily coordinator of the party's counseling board headed by Suharto. A year later, his position was elevated to the level of daily coordinator, a phenomenal development given the preeminence of the military in the ruling party. The entry of Habibie in the elite echelons of Golkar gradually "demilitarized" the party, a process that culminated in the election of Harmoko as the first chair of Golkar from the non-military faction in 1993. The reciprocity between Suharto and his engineer technocrat inevitably entailed an extensive level of synergy and cooperation that firmly cemented the formation of the technological state at the apex of the New Order authoritarianism structurally shored up by the military and the ruling party. A fanatic of high technology, Suharto exhibited his commitment to founding the technological state by approving a set of policies to foster Habibie's plans on several megaprojects. Constant political support from Suharto proved very effective in paving a smooth path for the high technology vision to be subsumed in *Garis Besar Haluan Negara* (the State Guidelines for National Development, GBHN), which constituted the most important step in guaranteeing continued flow of capital from the state budget, indispensable for the development of high technology. Allowed by the authoritarian structure of the New Order, Suharto doubtlessly granted all of necessary financial and political resources at almost any cost in order to make Indonesian technological development successful.

Political Islam

For many Indonesian Muslims who constitute the vast majority of the country's population, Islam is not just a religion. It is a worldview that guides social, cultural, and political life. Thus, political Islam emerged out of a belief that Islamic teachings provide insights to build a system of political governance founded upon Islamic ethics, morality, and justice. Yet, Indonesia is a not an Islamic state and since its inception it has been a secular one although the state ideology, Pancasila, acknowledges the role of religion in society. Under New Order rule, political Islam was nearly completely tamed by Suharto for many years before it was accommodated through a bridging role played by B.J. Habibie. The reconciliation between political Islam and the New Order regime mediated by Habibie, thanks to his symbolic power, took many observers by surprise. This was Habibie's most crucial role in politics and his connection to the Muslim modernist group generated a new political configuration that affected to a great extent how the technological state was consolidated. In this turn of event, political Islam as

an identity politics swiftly established a new association with Habibie's reputation and massively mobilized popular support for the venture towards the high technology world. This section describes how this episode unfolded.

The emergence of political Islam in the 1990s was not isolated from the continuum of Indonesian modern history. It stemmed from a long struggle of Muslim modernists[22] to implement *syariah* (Islamic law) in the state ideology. Their aspiration was encapsulated in seven words of the *Piagam Jakarta* (Jakarta Chapter) to be inserted into the first principle of Pancasila. But it never materialized and the movement of political Islam was plagued by frustration and despair in the era of Sukarno's Guided Democracy. The modernist party, Masyumi, was banned after being convicted of initiating separatist movements, while its leader, Mohammad Natsir, was put in prison. The fall of Sukarno in 1965–66 raised a new hope among the modernists that the new regime of Suharto would relieve Muslims' position in politics. But to the dismay of the modernists, the New Order launched specific policies that essentially circumscribed political Islam.[23]

Yet, as anthropologist Robert Hefner (2000) observes, Suharto's gesture towards Islam was not always restrictive. While refraining political Islam from being articulated in the political system, the New Order government openly endorsed religious activities that encouraged Muslim piety. Years of implementation of this approach altered the orientation of the modernists who gradually shifted their focus from politics to mass education and social welfare. With rapid economic growth resulting from development programs, a well-educated middle class emerged within the Muslim community that gave rise to social renaissance of Islam. In the decade of 1980s, a new genre of modernists appeared to advocate the cultural Islam movement. These junior modernists were mostly well-known intellectuals working in academia, non-governmental organizations (NGOs) and Muslim social organizations. They were less interested in the idea of the Islamic state, but rather in the cultural renewal of Islam. They deliberately eschewed power-driven politics because they believed it only distorted the true teachings of Islam. This was encapsulated in the famous phrase of the late Nurcholis Madjid: "Islam yes, Islamic parties no." Madjid was a prominent Muslim scholar who tenaciously sought to amalgamate Islamic values and modernity in the Indonesian context. He saw both as overlapping in many dimensions, and offered a middle way between secular-liberalism and Islam for the emergence of civil Islam.[24] His thoughts on Islam and modernity brought him to believe in what Habibie attempted to accomplish in high technology-based development.[25]

Political Islam gained momentum when ICMI was formed. ICMI was the brainchild of Imaduddin Abdurahim. "Bang Imad," as Abdurahim was popularly known was a respected Muslim scholar and former protégé of Masyumi's Natsir. He taught engineering courses at his alma mater, ITB, where he founded Masjid Salman, the pioneer of campus-based mosques that inspired mosque organization in many universities around the country. During the 1970s Abdurahim was a strong critic of Suharto's authoritarianism. In one speech, he mocked Suharto as a modern Pharaoh for building his grave while he still lived. Because of his dissent, which irritated the New Order leader, Abdurahim was sent to prison and

also fired from ITB. After released a couple of months later, Abdurahim moved to the United States and had a chance to complete a PhD in industrial engineering at Iowa State University. In 1986 Abdurahim decided to return home. Upon his arrival, he felt dismayed to find Muslim intellectuals split in various organizations, often opposing one another. Concerned about the disintegration, Abdurahim aspired to unite all Muslim intellectuals under one umbrella regardless of ideological inclination. From the outset Abdurahim was aware of the possible difficulty he had to face in founding an Islamic-labeled organization, given unfriendly gestures by the New Order towards Islam. He also knew that any activity that involved his name would alert the New Order panoptic machine. To avoid raising the regime's suspicion, he asked five students of University of Brawijaya at Malang to organize a national symposium on the role of Muslim intellectuals in development. Through the role of these Brawijaya students, Abdurahim was able to pursue his agenda while staying hidden. In the New Order political culture, a connection with a government official was unofficially required to establish a mass-based organization. Realizing this trend, Abdurahim persuaded his student fellows to gain the patronage of a well-placed regime official. After short listing numerous potential names, Abdurahim came to choose Habibie. Abdurahmim reasoned that although Habibie was not popular among Muslim activists, no one was closer to Suharto. Habibie's proximity to Suharto was deemed very crucial if their initiative was to go through. Yet, there was more to Habibie than just political factors. A personal consideration was taken into account in Abdurahim's decision to go with Habibie. He had been long impressed by the persona of Habibie. He heard that Habibie was a pious Muslim, consistently performing prayers five times daily and fasting every Monday and Thursday. Equally fascinating for Abdurahim were Habibie's credentials as a reputable scientific engineer. Being an engineer himself and a preacher as well, Abdurahim was convinced that two distinctive features in Habibie's persona were what precisely Indonesian Muslims needed from a leader.[26]

Realizing that they had found a perfect candidate, Abdurahim dispatched the Brawijaya students to approach Habibie in August 1990. Seeing it as a good opportunity, Habibie accepted the proposal on the condition that at least 20 Muslim intellectuals—all of them, as Habibie explicitly requested, must have a doctoral degree—would agree to back Habibie's leadership. Using his broad network with Muslim intellectuals and activists, Abdurahim managed to collect approval from persons more than what Habibie required, including Nurcholis Madjid. Convinced by the extent of support Abdurahim was able to obtain in such a short time, Habibie moved on to the next more important step: to consult Suharto. To the surprise of many, Suharto quickly granted his endorsement to Habibie. Without hesitation, Habibie informed Abdurahim that he was ready to lead the Muslim intellectual organization Abdurahim and his team had prepared. In December 1990, the national symposium of Muslim intellectuals kicked off. It was Suharto who inaugurated the event, which was held in Malang. The symposium resulted in the establishment of ICMI, which marked the beginning of the rise of political Islam in the New Order Indonesia.

ICMI was not an ordinary organization. Its birth altered the power landscape of the New Order and it caused the political pendulum to swing to a direction that by and large benefited the Muslim modernists. Despite allegations from Muslim pro-democracy activists, most notably Abdurrahman Wahid, that ICMI was driven by sectarian biases,[27] the association became a new venue for political Islam that attracted many Islamic groups in order to gain power. Its founders declared ICMI a non-political association, but its political influences in many ways outweighed the ability of any political group to mold decision-making at the top level. For instance, it had triggered the *penghijauan* (greening) phenomenon, a wave of Muslim activists entering parliament in the aftermath of the 1992 election. This was followed by the appointment of several ICMI-affiliated bureaucrats to key ministerial positions in the Development Cabinet VI (1993–98), a composition that Habibie had something to do with (see Chapter 3). The intimate relationship between ICMI and Suharto, thanks to the bridging role of Habibie, marked the reconciliation between Islam and the New Order. Even Abdurahim was allowed to continue his preaching activity—this time without clearance from the police. Muslims began to enjoy the freedom to express their Islamic identity, a striking development that signified Suharto's changed stance toward the Muslim modernists. As Islam became a source of social and political energy for the continuation of the New Order development, such a change brought about cultural effects that generated self-confidence among the Muslim community at large. "After ICMI, we are proud to be Muslims," said Alamsyah Ratu Prawiranegara, a co-founder of ICMI.

Given the prolonged conflict between Muslim modernists and the New Order regime, the unprecedented ascendancy of ICMI in power politics has intrigued observers as to why Suharto became suddenly keen to accommodate political Islam in the governing calculus. Indonesian observers split into two conflicting interpretations on this matter. Using a political analysis, the first camp, represented by the writing of Adam Schwarz, believes that ICMI resulted from power intrigues between Suharto who now sought a new base of support, and the military elites who grew unhappy with Suharto's leadership.[28] While this camp might be correct in observing dissatisfaction in the military elite, the other camp offers a cultural analysis equally worth noting.[29] For instance, Robert Hefner has argued that Suharto had in fact become less hostile towards Islam in the 1980s after observing that Pancasila had been accepted by all major Muslim organizations. Concurrently, the Islamic resurgence shifted its main agenda from political dominance to cultural renewal, rendering Islam no longer as a threat to the state. At this point, Suharto's interest and enthusiasm in Islam grew steadily. As Suharto's closest aide, Habibie, who was aware of this transition, offered Suharto a counterpart in learning Islam. As a result, the rise of ICMI was inevitable.

Regardless of which analysis is more accurate in identifying the real factor that caused the surprising shift in New Order politics to political Islam, one thing is clear. Political Islam added a new component of power to the relationship between Suharto and Habibie. For Suharto, as political observers have noted,

ICMI served as a channel through which to build a new basis of legitimacy that sustained his leadership; many Muslim modernists who were previously anti-Suharto changed their stance on the New Order and became staunch defenders of the regime after they joined ICMI. What gets less attention in the discussion of ICMI and political Islam in this particular period is the factor that urged Muslim modernists to keenly partake in the renewed political Islam steered by Habibie. I argue that this partly has to do with Habibie's symbolic power, which fascinated the Muslim modernists. Although not all Muslim modernists agreed with Habibie, the majority of the key figures were convinced that Habibie could contribute considerably to the Muslim community. This is exemplified in the way they described Habibie and praised his technological accomplishments. The late respected Muslim modernist Nurcholish Madjid, for example, referred to Habibie as "the epitome of the advanced development of Indonesia"[30] for his success to found a balance mix between rationality and spirituality. In a similar praising tone, noted scholar Ahmad Syafii Maarif saw Habibie as "a symbol of the emergence of Islam" whose fate is "to stand up at the frontline placing the Indonesian nation at a respected position in the world."[31] Even Muhammadyah leader Amien Rais, known to be critical of Suharto, highly commended Habibie by calling him a miracle maker after the success of the N250 (see Chapter 6).[32] These modernists shared views with Habibie on technology, human development, and national sovereignty, and believed that Habibie's achievements in technological fields represented the capability of the Islamic community to acquire Western technology.

The allegiance of the Muslims modernists to Habibie had enormous implications for the high technology agenda the New Order had set up under Habibie's leadership. ICMI not only enabled Suharto to strengthen his ties with the Muslims group but also permitted Habibie to solidify epistemological and political justifications for high technology-based development by mobilizing intellectual and political resources in ICMI. Soon after cash flowed in from the New Order government, ICMI formed the Center for Information and Development Studies (CIDES), a think tank bearing a mission to develop new concepts of development drawing on Habibie's concept of accelerated transformation. Its main activities included seminars and publications of journals and books that mostly stressed the strategic importance of high technology for the interests of Indonesian Muslims. In charge of CIDES was Adi Sasono, an engineer-turn-activist, who used Marxist arguments to voice the plight of the Indonesian Muslims. His right-hand man was Umar Juoro, an ITB physics graduate who studied economics at Boston University. Assisted by a number of ICMI nationalist economists, Sasono and Juoro ran ICMI programs, focusing on extending Habibie's ideas to a larger scope that resonated with problems facing Indonesian Muslims in general, such as poverty and educational backwardness. It was through CIDES that the high technology vision was linked to such issues as social justice and economic nationalism. It established a discursive connection of the technological state to the ground, which is a sort of mechanism for the elitist idea of high technology development to touch the grassroots. This was

facilitated by the launch of ICMI-owned daily *Republika*. Aside from providing a news channel on Islam and Muslim community affairs, more importantly *Republika* had primarily functioned as a promotion outlet for Habibie-led technological programs. The daily was meant to raise the awareness of the Muslim community of the technological megaprojects run by Habibie and his engineering team. It reported every single step of progress the New Order made in high technology development.

Yet, what appeared to be more powerful in wooing Muslim support for the high technology cause was Habibie's invention of new vocabularies that associated Islamic identity with high technology rationality. It was encapsulated in the concept of *iptek* and *imtaq*. Iptek stands for *ilmu pengetahuan* (science) and *teknologi* (technology), while imtaq means *iman* (faith) and *taqwa* (devotion). Habibie first coined these terms when delivering his opening speech at the Istiqlal Festival in Jakarta in February 1990. Since then, the terms have widely been used in the discussion on Islamic modernization in Indonesia. The balanced mix of iptek and imtaq is founded on the belief that Islamic values and modern knowledge are compatible. Furthermore, it is the obligation of the Muslim community to master modern technology. The discourse of iptek and imtaq was powerful because it was seen as a panacea to alleviate the cultural malaise that has paralyzed the Islamic world for centuries. A startling aspect of this discourse comes from the way it was disseminated. As I have discussed elsewhere,[33] this discourse permeated the Muslim community through religious activities. During the heyday of the New Order, the discourse of iptek and imtaq and the importance of high technology development for the Muslim world was a common topic that many Muslim preachers brought up in their sermons at mosques around the country. And it has remained an important subject of conversations among Muslim scholars to date.

In sum, the correlation between political Islam and high technology carried a two-fold benefit for the New Order. First, it provided a new basis of legitimacy for the regime to continue its rule. This was due to the widely shared conviction among the Muslims that the New Order's high technology developments would bring material and non-material advantages for the Muslim community. Second, collective acceptance of high technology development among the Muslims gave a boost to the New Order technological state to accomplish its goals.

3 Bureaucratization of technology

Solutions to the problem of knowledge are solutions to the problems of social order.

Steve Shapin and Simon Schaffer

When Habibie first met Suharto in Jakarta in January 1974 after his long sojourn abroad, it was more than just a sentimental reunion between two friends who had been apart for a long period of time. From that very moment, Habibie and Suharto shared ideas on the ways in which Indonesia ought to develop technological capacities and transform the economy for high technology production. Apart from an exchange of nostalgic memories, the conversation Habibie had with Suharto in the presidential palace centered on a detailed discussion of the institutional arrangements that they thought necessary to accelerate sociotechnical transformations in Indonesia. The result of this historic meeting defined the institutional edifice of the technological state that Habibie and his technocratic team would shape for the next 20 years; a transformative process that went along power dynamics in the New Order regime. This chapter documents the institutionalization of high technology that underlay the New Order technological state. Like any other type of state, the growth and operation of the technological state lies in bureaucracy, which according to Dietrich Rueschemeyer and Peter Evans (1985) constitutes the backbone of the state capacity to pursue its interest and to accomplish its objective.[1] Hence, this chapter describes the distinctive structure of technological bureaucracy that rapidly progressed from 1976 to the mid-1990s. In retrospect, an account of these institutional settings illuminates the formation of the technological state at the level whereby high technology and development ideas were closely intertwined resulting in what Gabrielle Hecht eloquently terms as a techno-political regime.[2] It was a techno-political regime because, similar to how Hecht defines it, the presence of this technological bureaucracy was constituted by a host of agencies, run by the people trained for and committed to engineering practices, guided by high technology ideologies and imaginaries, and defined by the high technology artifacts it produced. Accordingly, an array of governmental agencies along with research infrastructures that embodied Habibie's techno-political regime will be explored in this

chapter. Yet, a lengthier discussion will address the role of the BPPT, which was the stronghold of Habibie's engineer team and, more importantly, constituted the core of the New Order technological bureaucracy. Apart from examining the bureaucratization of technology, this chapter serves another purpose. It should be noted that although the New Order strongman solidly backed Habibie's techno-political regime, that regime's gradual expansion in the New Order bureaucratic fields was by no means frictionless. Fierce competition to Habibie's technology agendas was invoked by the UI economists who disagreed with Habibie's developmental strategy in many respects but particularly in how they construed development and the role of the state in the economy. Hence, the last part of this chapter elaborates the epistemological contradiction between the two technocratic groups and shows how the engineers eventually triumphed over the economists.

Inception of the agency

As Habibie describes in his biography, during his life in Germany he maintained a dream to dedicate his engineering knowledge specifically to the development of an aircraft industry in his home country.[3] When Habibie eventually traveled back to Indonesia in 1974, in response to a call from Suharto, although founding an aircraft manufacturing plant remained Habibie's first priority, the purpose of his repatriation was much broader than that. This is attributed to influences from Ibnu Sutowo, the founder of state-owned oil company Pertamina who claimed to have "discovered" Habibie and brought him back to Indonesia. In his memoir, Sutowo recounted how he "opened" Habibie's mind to realize a greater role he could play in Indonesian development than merely constructing airplanes.[4] Another salient factor that pushed Habibie to broaden his plans came from Suharto. From the outset, Suharto had explicitly expressed his interest in high technology and wished to create a bureaucratic environment favorable for high technology advancements as the chief driver of developmental transformation.

Thus, when Habibie flew to Jakarta in January 1974 to come face to face with the New Order leader along with Ibnu Sutowo, this was precisely the main agenda of their conversation. Tagging along with Habibie from Germany to Jakarta was his close acquaintance, Rahardi Ramelan, one of the Indonesian engineers Habibie hired at MBB. Ramelan was a bright engineer and lively person. He was trained as a mechanical engineer in the former Czechoslovakia and worked for Fokker for a few years before Habibie asked him to join MBB in 1968. Later, he became very close to Habibie as they shared a similar passion for pioneering an aircraft industry in Indonesia. In Jakarta, while Habibie was engaged in a strategic conversation with Suharto, Ramelan was tasked by Habibie to observe the situation and to muster plans for their final return. It took Ramelan about two weeks to figure out a possible scheme for the Habibie team to repatriate. Because they had lived in a developed country for so many years, Ramelan was to make sure that their return would be worthwhile. Upon completing his observation, Ramelan reported to Habibie with the conclusion that the

only possible arrangement for Habibie and his engineer compatriots to materialize their plans, without troubles and substantial obstacles upon returning to Indonesia, was to have an attachment to Pertamina. This was a plausible strategy given that the state-owned oil company was then the largest business corporation and the main source of the government's coffers. Ramelan even came up with a list of benefits that Pertamina was required to provide in order to facilitate the final return of these engineers. The list included a range of facilities such as housing, remuneration packages, bonuses, and even cars. The proposal was quickly accepted by Sutowo.[5] Hence, Habibie and Ramelan then flew back to Germany and a few months later they finally returned home for good. This time, they were accompanied with another eight engineers: Harsono Pusponegoro, Surasno Paramajuda, Sutadi Suparlan, Djermani Sandjaja, Sofjan Helmi Nasution, Abdul Munaf Gayo, Sofjan Harahap, and Gunawan.

Without much hesitation, Habibie's dream team landed in Jakarta in mid-1974. They had been hired by Habibie to work at MBB when the company needed a great number of engineers after West Germany was permitted by the United States to produce civilian airplanes. During their stint at MBB, these engineers already anticipated returning to Indonesia to build airplanes for the country. This was a commitment every one of them had made prior to joining Habibie at MBB[6]; none of them resisted when Habibie broke the news of return. The arrangement Habibie had established with Pertamina ensured them that they would not face financial problems in terms of their livelihood in the homeland, a reasonable concern given that Indonesia was then still largely a poor country. When Habibie and his team set foot in Jakarta, they immediately worked as Pertamina employees. To accommodate this group of European-trained engineers, Sutowo had established a special division within Pertamina called Advanced Technology and Aeronautical Technology (ATTP), which aimed specifically to prepare the inception of the aircraft manufacturer. Two years later, the division was renamed Advanced Technology Pertamina (ATP). This change reflected the broadening of tasks the division was meant to execute; it was no longer focusing on aircraft technology, for that mission was handled by the newborn IPTN in Bandung (see Chapter 5). Rather, ATP shifted its attention to a more strategic goal, which was to prepare the ground for the bureaucratization of technology. It was this division that later transformed into BPPT, a powerful developmental agency with authority stretching beyond technology matters. Before we proceed to that point, it is worth discussing how ATP carried out its tasks to lay the foundations for technological bureaucracy in Indonesia.

A fact worth noting was when the Habibie team joined Pertamina. As Takashi Shiraishi correctly points out, the oil factor was crucial in the early process of the institutionalization of high technology within the state.[7] At that time, Pertamina had recently gained astronomical amount of profits due to the skyrocketing of oil prices after OPEC had embargoed oil supply to Western countries in the wake of the Arab–Israeli War. The price of Indonesian crude climbed steeply within a year from US$4.75 a barrel in mid-1973 to US$12.60 a barrel in mid-1974. Being an oil-rich country in that era, Indonesia suddenly enjoyed windfall

revenues from precipitous hikes of oil prices which made Pertamina the most profitable corporation in Southeast Asia. For Sutowo, the oil bonanza was a big opportunity for Indonesia to leap forward and he was determined to invest the remarkable capital flowing from oil production into large-scale developmental projects. Suharto was discreetly in favor of Sutowo's ambitious plans. Despite protests from his economic aides, namely Widjojo and his colleagues, Suharto was convinced that what Sutowo sought to achieve in Pertamina in the future would strengthen Indonesia's industrial base. No one else benefited from the common interest of Suharto and Sutowo more than Habibie. His arrival in Jakarta could not have been more opportune. His imagination and Sutowo's control of Pertamina petrodollars combined led ATP to set up what would be the core of the technological state, which took shape solidly in the 1980s through to the 1990s.

ATP was first headquartered in a house on Jalan Biliton, which was strategically located in Central Jakarta. As the precursor of BPPT, ATP emerged as a small task force and, within two years, rapidly grew as a planning organization that prepared platforms for the realization of an aircraft industry and other large-scale technological projects. Although ATP was initially meant to accommodate Habibie and his team, the staff of ATP grew following its broadened assignments. In addition to Habibie and his MBB entourage, ATP personnel included several persons from Pertamina who were selected due to their expertise in engineering and finance. They were expected to contribute their experience in Pertamina to the success of ATP projects. Concurrently, Habibie also recruited a few of his old friends from college years who had earlier returned to Indonesia. These included Wardiman Djojonegoro and Parlin Napitupulu. The former was put in charge of BPPT's educational and training activities and was subsequently appointed minister of education in 1993.

How the Habibie team sought to influence and change the direction of Indonesian development was vividly reflected in the way ATP was initially organized and arranged according to four interrelated domains.[8] The first of these was industrial development, which constituted the original task Habibie's men carried out by establishing direct connections with Pertamina corporations and the Ministry of Industry. In the 1970s, the Indonesian economy was largely based on agriculture and Suharto was keen to strengthen the agricultural foundation of the country. Yet, following the path of the newly industrializing countries, the Indonesian government also sought to industrialize the economy and the Ministry of Industry was the spearhead of this transformation. The role of the ATP engineers was quite peculiar because although they were not part of the Ministry of Industry, they had access to Pertamina's financial resources, and thus had a say in industrial planning. It comes as no surprise that the Habibie team became very close to A.R. Suhud, then minister of industry, who laid the foundation of Indonesia's heavy industry. The second domain of the ATP activities was operations research. This is an engineering field that employs mathematical formulations applicable for decision-making and system design. Operations research is practically the core methodology of the engineers in development planning; it gives a

strong emphasis to technology as the main reference for making developmental decisions particularly at the micro level. Therefore, the majority of developmental projects under the supervision of ATP, and later BPPT, were planned and designed in accordance with parameters determined in operations research. ATP's third domain was considered highly strategic because it revolved around research on natural resources. The Habibie team wanted to harness Indonesia's natural endowments through technological development. The interests of Pertamina were evidently pivotal in the inclusion of natural resources as a domain for ATP to manage. As a state-owned corporation focusing on oil and gas exploitation, Sutowo-led Pertamina had plans to develop its own technological capacities that allowed the company to exploit the abundant minerals scattered around the country. The task of ATP was to provide the necessary expertise and to grow local capacities for natural exploration and exploitation such that Pertamina would not have to depend so much on foreign technology. Several ITB professors whose expertise in mining and other related fields were then invited to join ATP to help foster this field. Supporting all three aforementioned domains was the fourth: education and training. Habibie and his colleagues were keen to get involved in education and trainging as Indonesia's transformation toward a technological society would demand a greater number of high quality engineers. At first glance, this seems to overlap the role of the Ministry of Education and Culture. However, the focus of ATP differed, with the Ministry of Education and Culture concerned with the provision of basic education. From the outset, the Habibie team assumed that high technology development was possible if continuous production of adequate manpower, along with competency in engineering fields, was maintained. ATP was set to play this role as well and Djojonegoro was assigned to oversee this endeavor. When ATP was transformed into BPPT, Djojonegoro managed BPPT's education and training programs, one of which was to send thousands of Indonesian students abroad to study natural sciences and engineering at prestigious universities in industrialized countries.

With overflowing petrodollars from Pertamina, ATP appeared to be the highest funded governmental agency that drew envy from other governmental bureaus, including the UI economists at BAPPENAS who joined the New Order bureaucracy much earlier. The engineer technocrats often bragged about Habibie's proximity to Suharto, a political fact that greatly displeased the economic technocrats.[9] Yet, the Habibie men felt that they were assigned an important task and all the perks that ATP staff received were reasonably granted. More importantly, the role ATP was designated to play was unprecedented even by the Widjojo team. When Widjojo and his colleagues arrived in Jakarta one decade before, economic recovery was the main menu on their plate. Now the engineers carried out a similar task but with a different goal and within a different situation. The challenge they faced was much more specific than that of the economists. As the politics and economy were relatively stable unlike the era when the economists began their service to the New Order, it was easy for the engineers to embark upon a more ambitious mission that shifted the orientation of Indonesian development from the original model set by the economists.

Stretched authority

In April 1976, after ATTP was changed into ATP, its office moved to a 20-storey building on the Thamrin Boulevard, a luxurious location in the heart of Jakarta. The building then belonged to Pertamina and ATP was permitted to use the first two floors of the building. When activities of ATP were increasingly intensified, a corruption scandal in Pertamina broke out and shocked Habibie and his colleagues because it implicated Ibnu Sutowo. Sutowo was alleged to have misused Pertamina money to invest in commercial activities not directly related to the core business of Pertamina. The problem turned ugly when Sutowo was held responsible for causing Pertamina debt of US$2 billion, an enormous amount inevitably added to the government's debts. Facing pressure from his critics, Suharto eventually discharged Sutowo from Pertamina although he never charged him for the mistakes he made.[10] The impact of this affair on ATP did not last long even though Habibie had lost his financier. Soon Habibie and his engineer team at ATP began to establish their own authority and constant favor from Suharto remained their source of power to carry on. The fiasco in Pertamina was a blessing in disguise to the Habibie team. When Pertamina assets were taken over by the government in the aftermath of the Sutowo scandal, the entire property on Thamrin Street was transferred to ATP when it was fully transformed into BPPT in August 1978. This marks the official beginning of bureaucratization of technology in the New Order state.

Although never mentioned by Habibie in his biography, the naming of BPPT was originally suggested by Saswinadi Sasmodjo, a professor of chemical engineering at ITB, when he met Habibie in Munich in 1977. Sasmodjo was visiting Paris with two ITB professors, Iskandar Alisyahbana, then rector of ITB, and Filino Harahap, a professor of mechanical engineering, when they were invited to attend Habibie's birthday party. However, their visit to Habibie's place was more than just to celebrate his birthday. ITB is the oldest and most prestigious technological university in Indonesia and Habibie had long had interest in it. It was there that the ITB professors had a serious conversation with Habibie about the structuring of Indonesian technological institutions and what role ITB could play in supporting Habibie's plans. As Sasmodjo revealed in an interview, he had suggested that Habibie found an Agency for Assessment of Technology Application. Habibie took this idea but with a twist; it was not an agency only for assessment but also for application, hence the "and" was inserted.[11] The slight difference entailed significant implications to the activity and authority of the agency but the ITB professors felt content with the title. After all, what they sought from Habibie was a commitment to involve ITB in technological decision-making, a privilege that Habibie enjoyed due to his closeness to Suharto.[12] Reciprocally for Habibie, the ties with ITB were very important and strategic to boost his influence over UI economic professors.

An alliance between Habibie and ITB was formalized when ITB conferred on Habibie a professorship in 1977, shortly after the Munich meeting. The professorship seemed awkward since Habibie was not a faculty member at ITB. It is

difficult to find a good explanation why ITB was willing to grant Habibie such a high academic status without noting a political interest behind that decision. Iskandar Alisyahbana, the central figure behind Indonesia's first satellite program,[13] was mostly responsible for Habibie's professorship. He insisted that establishing a connection to Habibie would provide ITB with direct access to national policymaking, which had been predominantly steered by the UI professors.[14] Reciprocally, the professorship was regarded as a symbolic capital for Habibie to counter the academic standing of the Widjojo group. In Indonesian political culture, symbolic capital in form of academic rank is highly valued and this was what Habibie required in his struggle over bureaucratic resources in the New Order system. Symbolic capital was not the only advantage Habibie profited from his ties with ITB (the university he attended for one semester). In the course of 20 years of technological development, ITB supplied the majority of manpower Habibie needed to build the technological bureaucracy. In fact, many ITB graduates filled strategic positions in a variety of technological institutions under Habibie's jurisdiction.

With a presidential decree dated on 21 August 1978, the New Order government officially inaugurated BPPT as a non-department governmental agency, or LPND. However, BPPT was hardly an ordinary LPND, as it was headed by a minister. It was part of a bureaucratic restructuration package that Habibie proposed along with his appointment as Minister of Research and Technology. As mentioned earlier, when Habibie's predecessor, Sumitro Djojohadikusumoh, the Don of the UI economists, held this portfolio, it was called the Ministry of Research. When Suharto included Habibie in the Third Development Cabinet (1978–83), it was renamed the Ministry of Research and Technology, which seemingly emulated the platform of the West Germany cabinet at the time. The formation of BPPT added to a Habibie-led bureaucratic restructuration of the New Order government in which technology was organizationally incorporated into the central bureaucracy. It resulted in an inextricable structure between the Ministry of Research and Technology, publicly known as RISTEK, and BPPT; both were chaired by the same person. Consequently, all the policies that RISTEK produced were instituted and materialized by BPPT in an effective manner due to the tight connection that placed them together under one umbrella of authority. The model of BPPT was unprecedented and there is a reason why BPPT was formed in such a distinctive structure of bureaucracy. Rahardi Ramelan explained in an interview that the engineers wanted BPPT to be headed by a minister for only in that way the agency would be able to carry out its programs effectively. This is warranted since LPNDs usually lack authority to make decisions and their roles are fairly limited compared to those of ministerial departments. Hence, the peculiar structure that intertwined BPPT and RISTEK enabled BPPT to adopt shortcuts from the planning stage to implementation, which was a great advantage for the engineer technocrats. Another possible explanation congruent to Ramelan's explanation derives from the fact that the Ministry of Research and Technology was a state ministry without a technical department like the Ministry of Industry, Ministry of Health, Ministry of

Transportation, and so forth. This meant that RISTEK did not provide its own resources for Habibie to pursue his interests; he had to rely on other departments. Habibie was definitely aware that the absence of a technical department under the Ministry of Research and Technology would be a hindrance to accomplishing his goals because such a department serves as an institutional hand and body for the ministry to execute its programs. BPPT appeared to fill this lacuna. Even though it was an LPND, BPPT practically operated as a department to materialize a wide range of programs set by RISTEK.

In understanding the way BPPT was specifically tailored to boost high technology production, one fact should be underlined. Suharto explicitly admitted in his biography that from the outset, BPPT was meant to "accompany" BAPPENAS,[15] the central planning agency then headed by Widjojo Nitisastro. The question arises as to why Suharto would want to have another agency to compete with Widjojo's BAPPENAS, which made significant contributions to economic stabilization during the formative years of the New Order regime. For those interested in the Javanese concept of politics, the answer lies in the search for equilibrium that upon which politics in Javanese culture is predicated. A mythical definition of power as eloquently explicated by Anderson gives the basis of justification for such a theory to address the issue above. In this view, Suharto is observed seeking stability for his power by creating two groups of technocrats. Whether this theory holds true is hard to confirm. Yet, one thing is clear, Suharto was deeply fond of technology and had made many statements strongly stressing the importance of technology for national development. For instance, in his biography, Suharto remarked:

> Having abundant natural resources does not suffice to bring our nation to a better life and prosperity. Hardworking, tenacity, and strength accompanied by *our mastery of science and technology* and people's skills will define our progress and wealth.[16] [emphasis added]

This observation should not be taken for granted as it indicates the striking commitment Suharto made to high technology development without which the Habibie team would have been unable to change the trajectory of the Indonesian developmental process. Nevertheless, this alone does not explain why Suharto had favored Habibie to fashion BPPT, for there was another factor that led Suharto to push the engineers to "compete" with the economists. Suharto was likely to feel rather disappointed by the way the Widjojo team disparaged the importance of high technology in development, as evident in their confrontation with Sutowo who deeply shared Suharto's fascination with technology. Suharto certainly never explicitly expressed his disappointment to his economic aides because he nevertheless counted on their constant loyalty. BPPT was most likely formed as a sort of middle way to fulfill Suharto's enchantment of technology without harming the economic system the Widjojo team had built.

With such remarkable features coupled with unmatchable political backing, BPPT swiftly thrived as a governmental body arguably more powerful than any

other agency. Its authority even, to a certain extent, outspanned that of BAPPENAS even though Suharto stipulated that both agencies played different roles in development; macro-economic planning for BAPPENAS and micro-technical planning for BPPT.[17] In practical terms, it meant that BAPPENAS was fully in charge of allocating national budgets across all developmental sectors and virtually all other activities went to BPPT. BPPT was granted access to almost all developmental projects that involved technology across ministerial departments, from health, industry, energy and natural resources, to defense and security. The stretched authority of BPPT came from a broad definition of its primary tasks covering four activities. The first two tasks were essentially similar in nature to what BAPPENAS had undertaken, namely planning and coordinating. As stated in Suharto's address when officially inaugurating BPPT, the agency was primed "to prepare the formulation of general policies for technology assessment and application programs" and "to coordinate the implementation of technology assessment and application in a comprehensive and integrated manner."[18] Through these two tasks, BPPT became the sole governmental institution authorized to direct technology development in all public sectors. It entails that every single activity of development containing technological components ought to be planned, supervised, assessed, and approved by BPPT. If more than one organization were engaged in a technology-related project, BPPT would come into the fray and act as the coordinator. What afforded BPPT more leverage to penetrate into developmental programs across all ministerial departments came from another two primary tasks that Suharto wanted BPPT to fulfill. One was "to provide service in technology application both to public and private sectors," the other was "to undertake activities in technology assessment that support the government policy on technology development and application for industrial advancement."[19] These functions extended the roles BPPT played. It was not limited only to policymaking and planning; more importantly, it had the authority and capacity to execute technological programs harnessing an array of research facilities that were built as part of the BPPT organization,[20] a trait that distinguished it from BAPPENAS. To accommodate technology policies formulated by RISTEK, the organization of BPPT was divided into 11 major activities, each of which was equipped with advanced laboratories. The activities consisted of: (1) aerospace, (2) maritime, (3) energy, (4) transportation, (5) electronic, telecommunication, and computation, (6) material, (7) biotechnology, (8) processing technology, (9) defense and security (10) regional and environmental development, and (11) human resources. It comes as no surprise that BPPT was engaged in a wide spectrum of technological projects, from seaweed plantation in Sulawesi, hydro and solar power development for rural areas in eastern Indonesia, switching technology for telecommunication, to the selection of jet fighters for the Air Force and the construction of oilrigs for Pertamina. This was made possible as BPPT had representatives in the inter-departmental coordinating committee that approved every government contract.[21] Accordingly, every development project BPPT considered to have a technological component was subject to its intervention.

Planning, supervision, consulting, and development of technological products and systems were the main activities of BPPT. Yet, this did not comprise the entire domain of BPPT's authority. There was another large-scale project involving BPPT as one of its main actors for majority of the processes. Again, the role of Habibie was pivotal here. When he was appointed the Minister of Research and Technology and chair of BPPT, Suharto also tasked him to lead the Batam Industrial Development Authority, or *Otorita Batam*. Batam is an island of 415 km^2 adjacent to Singapore. Suharto had a vision to transform Batam into a high-tech-based industrial island able to compete with Singapore. Given his reputation in engineering, Habibie was the appropriate choice for Suharto to manage such industrial development projects in Batam in which none of the economic technocrats took part. Habibie turned the Batam development into a pure engineering project that sought to bring about a new industrial landscape on Batam Island. As a result, BPPT came to play an extensive role in Batam by contributing to human resource needs and the technological advancement of the island.[22] With extensive participation of BPPT engineers in the Batam project, the island became a sort of "experiment" whereby technological-minded planners from the Habibie group heavily influenced the planning and materialization of Batam's socio-economic changes. Yet, many have criticized what the Habibie group did in Batam, for the engineering-focused development caused a number of social problems rather than following, let alone overtaking, the economic success of Singapore.[23] Nevertheless, the Batam project extended BPPT's authority beyond what other conventional government bodies were able to reach.

Expanding the bureaucratic network

BPPT was clearly the flagship institution that embodied the bureaucratic structure of the technological state. However, BPPT was not the only case that represented the bureaucratization of technology in the New Order state structure. A number of high-level governmental institutions were just as crucial in reinforcing the technological state through activities and programs in different fields which supplied scientific and technical knowledge for the state. Suharto purposively placed these institutions as part of the organizational structure of the technological state, allowing Habibie to pool the majority of research and technological institutes into a centralized control under the Ministry of Research and Technology. Close connections between these governmental bodies resulted in a network of technologically minded bureaucrats and researchers who shared a common goal of building national capacity in science and technology. To understand how this network worked, Figure 3.1 illustrates the structure of this network, which revolved around the Habibie leadership.

As seen in Figure 3.1, playing the roles as advisory partners of the Minister for Research and Technology were the National Research Council (DRN) and Indonesian Academy of Sciences (AIPI). The former consisted of scientific experts from a variety of disciplines, ranging from engineering, medical, physical and biological sciences, to social sciences and humanities; the latter was an

association, the membership of which was filled by selected figures highly regarded in scientific fields. The main role of the two was to give recommendations to the minister pertaining to major issues in science and technology policy. However, these advisory committees were barely functional as Habibie awkwardly chaired both. There were not much discussion and exchange of ideas contributed by members of DRN and AIPI because Habibie's thoughts mostly occupied the discourses of technology policy promulgated by these organizations. Nevertheless, DRN and AIPI served to accommodate those who agreed with Habibie's technological visions and extended the network of scientists and engineers beyond governmental institutions.

A larger part of the technological bureaucratic network comprised several research institutions (LPNDs) whose activities were meant to fulfill a range of needs of the state in managing development in the entire Indonesian archipelago. These institutions included the Indonesian Institute of Sciences (LIPI), Agency for Mapping and Surveys (BAKOSURTANAL), National Institute of Aeronautic and Space (LAPAN), Central Bureau of Statistics (BPS), and National

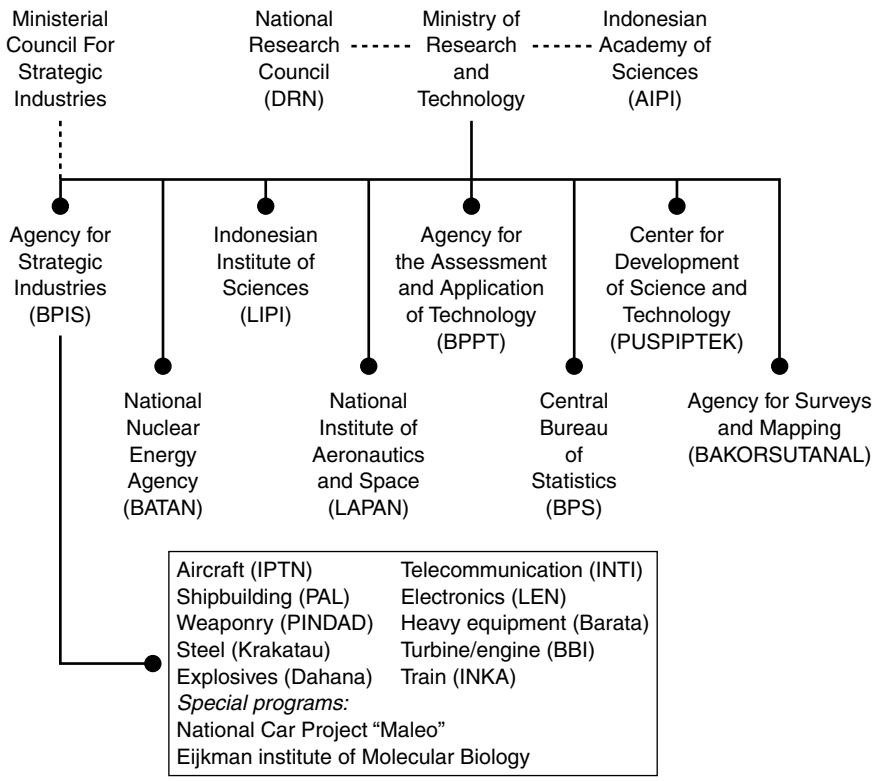
Ministerial Council For Strategic Industries
National Research Council (DRN)
Ministry of Research and Technology
Indonesian Academy of Sciences (AIPI)
Agency for Strategic Industries (BPIS)
Indonesian Institute of Sciences (LIPI)
Agency for the Assessment and Application of Technology (BPPT)
Center for Development of Science and Technology (PUSPIPTEK)
National Nuclear Energy Agency (BATAN)
National Institute of Aeronautics and Space (LAPAN)
Central Bureau of Statistics (BPS)
Agency for Surveys and Mapping (BAKORSUTANAL)
Aircraft (IPTN)
Shipbuilding (PAL)
Weaponry (PINDAD)
Steel (Krakatau)
Explosives (Dahana)
Telecommunication (INTI)
Electronics (LEN)
Heavy equipment (Barata)
Turbine/engine (BBI)
Train (INKA)
Special programs:
National Car Project "Maleo"
Eijkman institute of Molecular Biology

Figure 3.1 Organizational structure of scientific and technological institutions under Habibie leadership.

Nuclear Energy Agency (BATAN). A great deal of scientific and technological outputs came from these institutions. BATAN, for example, dates back to 1957 when Sukarno was concerned about radioactive fallouts resulting from a series of thermonuclear tests in the Pacific by the United States. Later on, the agency developed interests in producing nuclear energy. Although the construction of nuclear power plants in Indonesia never materialized in the New Order era, BATAN's programs constituted one of the major high-tech programs that drew considerable financial support from the New Order regime.[24]

With the exception of BPPT, all these governmental institutions were formed during Sukarno's reign; they were neither Habibie's brainchild nor Suharto's. This could indicate a continuity of technological visions from the Sukarno leadership through Suharto. What appears distinctive during the New Order period is centralized control in the hands of Habibie, and unprecedented development of research infrastructures as demonstrated in the establishment of Research Center for Science and Technology Development, known as PUSPIPTEK, located in Serpong, in the outskirts of Jakarta. Although it was Sumitro Djojohadikusmo who came up with the proposal to build PUSPIPTEK, the materialization of this integrated research facility was seriously undertaken when Habibie assumed his ministerial duties. Starting in 1976, PUSPIPTEK arguably pioneered, at least in the Southeast Asian context, the creation of what we now know as a "technological park." Although PUSPIPTEK was not built precisely like the Silicon Valley of California, a widely duplicated model of a technological park in which university researchers and entrepreneurs collaborate to innovate, they have in common in the way scientists and engineers are geographically clustered within an area. Occupying an area of 1,600 acres in what is now the Banten province, PUSPIPTEK was built as a special district that not only housed laboratories, but also residential areas for researchers and other public facilities such as markets, religious facilities, and schools. It is practically a city in its own right. In 1983, Habibie founded *Institut Teknologi Indonesia* (ITI) nearby to increase the supply of knowledgeable engineers for innovation activities in the park. In retrospect, PUSPIPTEK was an important component to accelerate industrialization; it was designed to produce a synergy among well-trained researchers, well-developed research laboratories, and accumulated expertise in a broad range of scientific and engineering disciplines.

This technological park consisted of 35 R&D laboratories—considered cutting-edge at the time they were opened—where researchers were able to carry out experimental projects useful for accelerated development. Four governmental institutions constituted the main tenants of PUSPIPTEK, comprising of BPPT, BATAN, LIPI, and the Ministry of Environment. Two large research facilities are worth mentioning, one of which was the Aero-Gas Dynamics and Vibration laboratory, which belonged to BPPT. This laboratory was equipped with a low subsonic wind tunnel as a result of collaboration between Indonesian engineers and their Dutch counterparts. This multi-million dollar equipment was originally developed and constructed in 1988 to support the development of IPTN airplanes. Accordingly, most of the projects conducted in this facility were meant to serve the aircraft testing needs of IPTN. Another large-scale facility housed within

PUSPIPTEK was BATAN's 30 megawatt nuclear research reactor named after G.W. Siwabessy, Indonesia's first nuclear scientist. It reached criticality in 1987 and was the largest operating nuclear reactor in Southeast Asia. The sheer scale of these two facilities simply reflected two major technological enterprises the New Order had intended to materialize: the development of an aircraft industry and the production of nuclear power.[25] It should be noted that all research institutions under Habibie did not constitute the entire research activity of the government. Other ministries, e.g., transportation, agriculture, health, industry and trade, etc., had in-house research and development divisions. However, many of these research institutes were poorly funded and their scientific infrastructures and manpower were lagging behind those under Habibie's jurisdiction.

The running of these enormous research infrastructures as part of the bureaucratic network of the technological state certainly required a tremendous supply of manpower equipped with scientific knowledge and skills indispensable not only to operate the available facilities but more importantly, to expand knowledge production and innovation. This problem emerged at the early formative stages of the technological state in Indonesia. Higher education sectors were then largely undeveloped in terms of quantity and quality of its graduates that were supposed to be absorbed by technological sectors. Although a few universities such as ITB and UI were relatively more advanced than others, the production capacity of these elite educational institutions was somewhat lacking.[26] Realizing that manpower was crucial to the success and sustainability of technological progress, Habibie and his team arranged a special scheme that aimed to accelerate the production of highly educated manpower suitable for the nature and culture of high technology development. Wardiman Djojonegoro, who then served as deputy chairman of BPPT, was assigned to lead this program. The planning of manpower development for science and technology programs started in early 1984, resulting in the Overseas Fellowship Program (OFP) one year later. OFP was designed to upgrade scientific and technological capabilities of all LPNDs under the Ministry of Research and Technology; it was targeted to train around 1,500 researchers through overseas studies encompassing undergraduate and graduate degrees, all focusing on physical sciences, engineering, and technology. Most of these researchers were sent to universities in Europe and the United States. The largest group of students went to Germany, followed by UK, France, and the US. This well-organized initiative sought to produce a critical mass of science and technology manpower in a long-term process. Habibie financed the program as he managed to secure a soft loan from the World Bank, which amounted to US$93 million. While the loan was channeled through BAPPENAS, BPPT was designated to manage the entire program. By the end of the program in 1992, OFP fellows who had returned home constituted about 20 percent of all LPND employees. When the OFP program was about to terminate, another similar fellowship called Science and Technology Manpower Development Program (STMDP) began. This time the funding was sought from the Overseas Economic Cooperation Fund (OECF) of Japan, which granted a loan of 6 billion yen (about US$48 million). Not surprisingly, the majority of Indonesian students (60 percent) who were accepted into the program were sent to Japan to

complete undergraduate and graduate degrees in a variety of physical science and engineering fields. The remaining 40 percent were dispatched to other countries such as the UK, France, and Germany. The program resulted in about 500 fellows who filled various positions in LPNDs. In addition to OFP and STMDP, the Science and Technology for Industrial Development (STAID) started in April 1990 to perpetuate scientific and technological projects for the next ten years. The funding of this program was partially covered by a US$53 million loan from the World Bank and a US$43 million loan from the OECF, while the Indonesian government provided additional funding. What distinguishes STAID from the other two programs lies in the management of the program: BPPT was relatively more autonomous in running and overseeing the whole process. Strengthening scientific and technological infrastructure, in particular those at PUSPIPTEK, was the main objective of STAID. When STAID ended in 2003, a total of 1,525 students had been trained in a variety of overseas universities.[27] Djojonegoro described the nature of these fellowship programs as follows:

> OFP and STMDP are [Government of Indonesia, GOI] fellowship programs designed to provide the brightest and most talented GOI employees with an opportunity to enhance their skills and knowledge—evidence by obtaining a formal foreign academic degree—so that they, upon return, can contribute to the development of our country.... From the beginning, OFP and STMDP have been highly selective and strict in an effort to train the "leaders of tomorrow."[28]

The above statement clearly underlines the elitist inclination of the fellowship programs; they were fashioned in a selective recruitment process to produce a small pool of scientists and engineers with a high capability to transform Indonesian industry into a technology powerhouse. With tremendous financial support, the Habibie team aimed to prepare a sustainable succession of highly trained researchers who would have global experience and world-class competence, deemed indispensable to enhance Indonesia's industrial competitiveness. This overseas training, however, was contradictory to the educational policy prompted by the Widjojo team in which basic education for a larger portion of Indonesian population was placed as a higher priority.[29] As a result, disagreements arose between the engineers and the economists in terms of using state funding and developmental policy. The following section will describe how these disagreements unfolded, resulting in the struggle over bureaucratic resources between the engineers and the economists.

Trouncing the economists

Ever since Habibie joined the highest level of the New Order bureaucratic structure, the confrontation between the engineers and the economists had marked the politics of technocracy in the New Order era that has hitherto affected the discourse of national development in post-Suharto Indonesia. According to

Sudrajad Djiwandono, former junior member of the Widjojo team at BAPPENAS, the quarrel between Habibie's engineer and Widjojo's economic teams had originated from Ibnu Sutowo.[30] As previously mentioned, Sutowo facilitated Habibie's permanent return to Indonesia; they had a great deal in common in the vision of the role of technology in accelerating Indonesian development. Widjojo and his colleagues however, from the outset, never agreed with Sutowo, particularly in the way he controlled Pertamina. The clash between Widjojo and Sutowo culminated in the expulsion of Sutowo from Pertamina, a tragic ending that Sutowo believed implicated the Widjojo team along with the World Bank and IMF.[31] When Habibie and his team began their bureaucratic career in the New Order regime, they seemed to inherit Sutowo's clash with the economists.

The significance of this technocratic clash should not be understated because it incredibly marked the politics of policymaking during the New Order period. Adam Schwarz, a political observer on Indonesia, even dedicated one entire chapter in his thick-volume *A Nation in Waiting* to describe this fragment of New Order politics.[32] While Schwarz shed more light on the political tensions in policymaking between Habibie's group and Widjojo's, I would like to highlight one underlying fact: the competition between the Habibie and the Widjojo groups lies in the discrepancy between their technocratic epistemology, producing far-reaching implications in the allocation of economic and political resources. The contradictions of technocratic approaches between Habibie and Widjojo merit further examination because they highlight the discursive aspects of Habibie's thoughts that strongly characterize the technological state. To this end, the tensions between the engineers and the economists are perhaps best presented in the notion of *Habibienomics* versus *Widjojonomics*. The term Habibienomics[33] was coined by economist Kwik Kian Gie in his March 1993 op-ed (opposite the editorial) piece in *Kompas*, in which Kwik critically examined Habibie's concept of economic development.[34] The article was primarily a response to a speech Habibie delivered during the opening ceremony of CIDES. Seeking to pull Habibie's development thoughts to pieces, Kwik's article instead popularized the term *Habibienomics*, which he used to refer to the development concept based on added value that characterized Habibie's rationalization for high technology in Indonesian development. Later on, Habibienomics was placed in contrast to Widjojonomics,[35] referring to the Widjojo team's neoclassical economics. Kwik's article spurred heated debates that began to snowball, involving public figures on both sides. Although Habibie once explicitly said, "There is no such thing as Habibienomics and Widjojonomics,"[36] his developmental policy and that of Widjojo were almost on opposite ends of the spectrum. Habibie's proponents from ICMI, most notably Dawam Rahardjo, Umar Juoro, Dipo Alam, and Sri Bintang Pamungkas, arrived at the scene to defend Habibienomics, while from the economists camp appeared several figures closely connected to the Faculty of Economics at UI, namely, Emil Salim, Sri Edi Swasono, Sjahrir, and others. For a period, the debate between Habibienomics and Widjojonomics filled journalistic columns of most mass media channels. It also occupied many seminars and academic discussions at university campuses.

Habibienomics and Widjojonomics are not entirely diametrical. There are common grounds on which Habibienomics and Widjojonomics agree. They share views on the emphasis on economic growth as the primary goal of development. Habibienomics is somewhat receptive to the trickle-down mechanism that, in the economists' perspective, would presumably distribute wealth evenly in society. Furthermore, Habibienomics places industrial sectors at the core of development, following the assumption upheld by the economists that industrialization is the fastest track towards economic progress.[37] Despite their agreement on economic growth and industrialization, the two schools differ in their views on the sources of economic growth and the foundations of industrialization. Let us now look at the content of this debate by peeling layer by layer the arguments presented by each camp. Despite the broad issues covered in this paradigmatic schism, the debate between the engineers and the economists basically revolved around the conceptual juxtaposition of competitive advantages vis-à-vis comparative advantages. Pro-Habibie economists questioned the adequacy of Widjojonomics by debunking the concept of comparative advantages that had laid the foundational logics for the economists in managing Indonesian economy. Drawn from David Ricardo, this concept was one of the classical theories that have remained influential in international trade dynamics.[38] In a nutshell, the theory of comparative advantages seeks to identify the kind of good from which a country would gain maximum benefits in its production. A country is said to have comparative advantage in the production of a particular good if it can produce the good at a lower opportunity cost than that of other countries. Thus, specialization is key in this approach. To identify a country's comparative advantage requires comparison of production costs across countries, which are constituted by labor costs and material supplies. For Indonesia as a developing economy, its comparative advantages are initially derived from its abundant natural resource endowment and then from a large supply of cheap labor. The economists saw these two resources as bearing the most significant ability in yielding high economic growth. Accordingly, for years the economists formulated policies to produce supportive environments for foreign and domestic investors to tap into the natural resources and low-wage labor that Indonesia offered as primary advantages.

For Habibie and his proponents, a focus on comparative advantages as formulated in Widjojonomics was an apt choice only for the first 25 years of development. Although they admitted that the Widjojo team had succeeded in laying the foundation of Indonesia's modern economy, they argued that relying on comparative advantages for the next phase of a long-term development was not favorable for two reasons. First, relying on natural resources was not dependable because the mere exploitation of natural materials from the archipelago without further processing could only produce low-value commodities. Only by producing technology-based products could Indonesia gain more economic value. In addition, the engineers pointed out, Indonesia's natural resources are not unlimited. Hence, if Indonesia kept relying on natural resources alone, it would risk depleting those resources, thereby jeopardizing the continuity of economic

growth. The second criticism was concerned with the labor factor. Pro-Habibie economists argued that cheap labor is unsustainable indefinitely since wages are likely to rise when the economy starts soaring. They stressed the fact that Indonesia's private industries mostly comprised footloose industry that could easily flee to another country offering lower labor costs. This, according to pro-Habibie Umar Juoro, was a fatal shortcoming in the economists' comparative advantage-oriented industrial policy.[39]

Pointing out these inadequacies in the comparative advantages approach, the engineers presented Habibienomics as a new developmental paradigm that offered a stronger conviction for strengthening the foundations of Indonesian industry.[40] The new approach offered in Habibienomics derived from the concept of competitive advantages as opposed to the comparative ones. Michael E. Porter (1990) introduced the concept of competitive advantages to criticize neoclassical economists, most notably, Adam Smith and David Ricardo. Whereas Porter's concept of competitive advantages deals with macro-economic structures, in Habibienomics competitive advantage is narrowly interpreted as the capacity to produce the so-called "added value." Added value is generated from the utility of product created by engineers; hence, mastering high technology would speed up the process of creating added value to benefit the economy. Habibie maintains that products containing high technology components have more competitive advantage in the market than low-tech industrial products primarily relying on cheap labor, namely, textile and plywood, which constituted half of Indonesia's non-oil exports.[41] This is because only those with advanced technological capabilities can penetrate the market of high-tech products, thus providing a small group of producers with the privilege to determine prices.[42] A corollary of this approach is that producing highly educated scientists and engineers constitutes a primary role in the production of high technology. The significance of capable human resources, in Habibie's view, lies in the fact that economic progress depends less upon natural resources than human ones. Habibie referred to the remarkable economic progress of the "Asian Tigers," namely, Japan, South Korea, and Taiwan, whose natural resources were scarce but managed to achieve high economic growth through highly educated human capital.

For those adopting the side of the economists, the dominance of Habibienomics on development policy jeopardized the stability of the nation's economic structures, a legacy of Widjojo's group. For pro-Widjojo economists, a fundamental weakness in Habibienomics lies in its ignorance of the market factor and excessive emphasis on the supply side while overlooking the demand side.[43] Furthermore, Habibie's high-tech-oriented development was regarded as economically inefficient in terms of resource allocation. Given the limited financial resources Indonesia has, concentrating on high technology development inevitably entailed forgoing other sectors that could be more beneficial for the populace as a whole.[44] After all, Habibie's enormous spending on developing costly technologies failed to address social issues such as poverty and unemployment. His large investments in human capital and technology-intensive projects may have exacerbated the nation's economic problems.[45]

Interesting to examine here is how these two technocratic regimes differ when it comes to the ways they construe the interrelationship between technology, economy, and the state. For the economists, whose view of technology is strongly influenced by neoclassical economics, technology is an exogenous factor; that is, technical change is a byproduct of market competition. Demands of technology among manufacturing firms are determined by incentive systems consisting of macro-economic policies, trade regime, and domestic competition as well as efficiently working production factors. The role of the state is thus limited to ensuring the working of market mechanisms that would provide a more equal distribution of wealth.[46] In contrast, following the theory which views technology as endogenous,[47] the engineers opposed the economists by asserting that technology is not merely a byproduct of market mechanisms, but is itself the primary source of growth. The engineers believed that sustainability of economic growth depends on how much effort the state undertakes to encourage the development of new technology. For that reason, the engineers called for an active role of the state to support technological endeavors directly, including providing protection and subsidies.[48]

Over 1986–92, the pendulum of power seemed to move towards the Widjojo group. At that point, liberalization was the buzzword as Suharto, compelled by the global economic downturn, implemented a series of structural adjustments under the auspice of Widjojo following IMF recommendations.[49] However, liberalization in the form of deregulation did not alter much of the state structure. While financial sectors were mostly subject to deregulation programs, the entire edifice of Habibie's techno-political regime escaped the Widjojo-led structural reforms. Moreover, before the liberalization period ended, the reign of the economists in policymaking began to decline. A number of factors fermented this downfall. Despite the economists' contribution to building a modern economic foundation of the nation and in reshaping the economy by reducing the reliance on oil-related commodities, a group of ICMI-affiliated nationalist economists, most notably Didik J. Rachbini, Umar Juoro, and Dawam Rahardjo, questioned the liberalist approach of the Widjojo group, emphasizing two major predicaments. First, ever since the economists made connections with the IMF and the World Bank, Indonesia's foreign debt soared. From 1988 to 1992, during which time the economists' deregulations were implemented, debt continued to grow, reaching US$136 billion in 1997. As such, Widjojo and his colleagues were blamed for being too submissive to the economic recommendations of the IMF and the World Bank.[50] Second, Widjojo's market-based economic programs were allegedly favorable only to large private corporations, while hindering the growth of small- and medium-scale enterprises.[51] As a result, this criticism elaborated further, Indonesia's high economic growth for three decades had been accompanied by striking inequalities. Related to this, ICMI-affiliated Adi Sasono bemoaned that most of the privileged businessmen were ethnic-Chinese and Christian minorities, who controlled 70 percent of the total capital. This evoked ethnic and religious sentiments among the Muslim community, which constituted the larger majority of Indonesia's population.[52]

At the time, when nationalist and socialist-oriented economists were questioning the economists' technocratic approach, Habibie and his adherents conjured up a new approach wrapped in nationalistic themes that appealed to the general public. The 1990s marked the growing significance of the engineers in determining the path along which Indonesia ought to pursue its economic development. It was by no coincidence that the rise of the engineers in policymaking occurred when Habibie successfully founded a new base of political supporters through his leadership in ICMI. The triumph of the engineers over the economists culminated when Suharto announced the composition of the Sixth Development Cabinet in March 1993. A number of ministerial positions, usually filled by Widjojo's protégés, were now transferred to other groups, most notably the engineers. After two decades of dominating industry and trade portfolios, the economists had lost their positions.

In the new cabinet, the economists were represented only by three ministers: Saleh Affif (Coordinating Minister for Economy, Finance, and Development Supervision), Sudrajat Djiwandono (Governor of Bank Indonesia), and Mari'e Muhammad (Finance).[53] Within the engineer camp, Habibie successfully installed his loyalists in several positions while securing a fourth term of his own as the Minister of Research and Technology. The first two ministers directly linked to Habibie were Satrio Budihardjo Joedono and Haryanto Dhanutirto;[54] both were among ICMI top officials whose careers grew by their association with Habibie at BPPT. They were placed in the cabinet to pave the path for Habibie's technological agendas. Joedono was appointed as Minister of Trade[55] and clearly assigned to eliminate trade barriers for the marketing of IPTN products both in domestic and foreign markets. Likewise, the appointment of Dhanutirto as Minister of Transportation was meant to synchronize air transportation services and IPTN projects. Having handled BPPT fellowship programs for years, Wardiman Djojonegoro was named minister of education and culture to enhance nation-wide science and engineering education and training to produce more skilled workers for high-tech based industries, a program he called "link and match." Along with three strategic portfolios held by Habibie's men, a number of other ministerial positions went to people who shared Habibie's technological views: for example, Hartarto Sastrosoenarto as Coordinating Minister for Industry and Trade, and Tunky Ariwibowo as Minister of Industry. Graduating from ITB's chemical engineering program, Sastrosoenarto was known for his tenacious efforts to strengthen local industrial capacity in petrochemical products, while Ariwibowo, also an ITB graduate, had been involved in many industrial development programs, most notably in Sutowo-initiated Krakatau Steel. These two ministers undoubtedly stood on Habibie's side. The hardest hit for the economists was the loss of BAPPENAS, a strategic post exclusively retained by the economists for years. Within the new cabinet, this portfolio was surprisingly given to Ginandjar Kartasasmita,[56] an engineering-trained bureaucrat strongly committed to the enhancement of Indonesian technological capacity. Assisting Kartasasmita was Habibie's long-time colleague Rahardi Ramelan, who Suharto appointed as deputy chairman of BAPPENAS. The seizing of BAPPENAS by the engineer group was evidently significant for the consolidation of the technological state, for it held the

authority to underwrite every government-funded development project. Facing this new composition of the New Order cabinet, it was clear that a paradigm shift in Indonesian technocratic style was underway that would alter the orientation of policymaking, one emphasizing new rationalities, modalities, and technocratic style.

How could one explain this shift of technocratic dominion from the economists to the engineers? Although the cabinet composition is the prerogative of the president, in the New Order politics the cabinet was a field of struggle among interested parties that reflected the political dynamics and competition among elite groups. Accordingly, a turn in the structure of New Order high-level decision-making towards the engineer camp signaled the growing strength of Habibie in Indonesian politics. There was no doubt that Suharto's inclination towards high technology caused this shift. Kartasasmita rationalized this shift as follows:

> In entering the Sixth Five-Year Development Plan [PJPT 2], our main concern is that economic growth that we want to achieve, the distribution of development that we want to result, and national stability on which we rely to undertake development, are all impossible to be materialized without the ability to develop science and technology.... Our lag behind other countries in terms of national incomes is simply due to our weakness in science and technology. Consequently, we have to place science and technology at the core of our development strategy.[57]

By stressing the importance of science and technology for the next long-term development plan, Kartasasmita implied that the ascendancy of the engineers in the New Order technocracy was a plausible consequence of change in the development orientation. If the rise of the economists in the 1960s was a response to the economic chaos, the rise of the engineers in the 1990s was a response to an entirely new challenge in which high technology became a key variable to competing in the global economy.

While it was clear at the point that Habibienomics had prevailed over Widjojonomics, it did not necessarily mean that Suharto had completely casted out Widjojo and his team from his political rule. To the confusion of many observers, Suharto named Widjojo and Ali Wardhana as personal economic advisors in March 1993 shortly after the Sixth Development Cabinet was revealed. Many believed that this decision was meant to sustain Suharto's link to foreign financial institutions. It could also mean that Suharto wanted to keep the economists' loyalty and obeisance for purposes of his regime so that he still would have economic experts to consult in times of crisis. The latter seems to be more acceptable as a few years later, when the Asian crisis shook the Indonesian economy, it was Widjojo and his team whom Suharto requested to stabilize the monetary turbulences. Until then, the Widjojo team remained critical of Habibie's developmental policy and this created cracks within and disunity of technocracy between the engineers and the economists, eventually afflicting the stability of the technological state during the concluding year of the New Order.

4 Building strategic industries

The intellectual requirements that must be met for social institutions to be stable are matched by social requirements for classifications.

Mary Douglas

It took nearly one decade for BPPT to become an influential body within the New Order central bureaucracy that held a wide spectrum of authority in technology-related sectors. As noted in the preceding chapter, the chief purpose of BPPT concentrated on organizing state-funded activities and programs in high technology research and development. When the accumulation of technical knowledge reached a critical mass, a question arose as to how technological innovations the thousands of BPPT researchers produced ought to be absorbed and adopted by industry. Given its peculiar political economic structure, the New Order took a path quite distinct from the experiences of East Asian developmental states. This chapter gives an account of how the New Order government attempted to industrialize technological innovation through a cluster of strategic industries, a concept that underlies the distinctive feature of the technological state. As illustrated in this chapter, the New Order came to utilize a pool of ten state-controlled industries to lead the acceleration of technology-based industrialization that produced industrial products for a range of important public sectors such as transportation, telecommunication, infrastructure, and military. This approach was meant to establish an industrial setting appropriate for robust production of high technology through centralized authority over state technological resources in the hand of the engineer technocrats. To delineate the tenacious efforts of the New Order to build, organize, and foster strategic industries, this chapter probes the underlying logic of such a colossal endeavor. It also discusses the meaning of "strategic industries" that rendered high technology-based industrialization to accelerate with full state support. Lastly, the notion of technological nationalism is analyzed to reveal how nationalist rhetoric justified the entire process of high technology development.

Acquiring state-owned companies

Of great importance one can draw from political economy studies on East Asian developmental states is the striking ability of the state to direct private sectors to embark on rapid industrialization and to make higher productivity. In such a setting, the state focused its resources on upgrading its capacities to dictate private-run industries through strong and solid organization of bureaucracy, while private businessmen were drawn to follow directions stated in state policies that sought to improve industrial performance and technological innovation (Chang 2006). As a result, the attempt to enhance national competitiveness through research and development lied mostly in programs and activities run and funded by private sectors. Hence, industrial innovation occurred predominantly within the domain of private industries and most of the funding of this nature was part of business investments (Chu and Hill 2006).

On contrary, scientific research and technological development for industrial purposes in Indonesia during the New Order period were mostly carried out by state-related organizations. Certainly this is not unique to Indonesia. However, in the context of industrial technology and development, the path down which the New Order chose to direct technological research and innovation for industry was quite diametrical to what appeared prominent in East Asian states, particularly if we look at the scale of the utilization of state-linked institutions for such a goal. Indeed, it is true that the New Order government gave privileges to private conglomerates to control much of the manufacturing domain and to contribute a considerable proportion to industrialization processes. Although private industries progressed rapidly due to the import-substitution policies that the New Order implemented during the 1970s and 1980s—following the global trend of development at the period—the growth of private enterprises in manufacturing sectors did not make it necessary for corporations to deepen their capacity in research and development (R&D). Most large-scale industries, such as automobiles and electronics, made profits primarily from imported technologies from their principals in Japan, South Korea, Germany, and the United States. Imports of technology included tool machineries and product innovation where only a tiny part of these had been localized. Despite the fact that these industries partly belonged to Indonesian businessmen, new product development and technological innovations in private industries were largely dictated by the headquarters of the principals; the local businessmen often at times acted as a passive partner in research and technological innovation. A few of these industries did have R&D divisions within the company, but product development activites were limited to an infinitesimal portion in design and engineering that produced insubstantial innovations and scientific outputs. Many Indonesian industrial observers identified the cause of this failure to be two-fold. On one side, private sector companies were generally reluctant to spend money on R&D due to a high risk of failure. They would rather purchase imported technologies, which had been proven successful in the market. On the other hand, foreign principals had no genuine intention to transfer their technology to their local partners and provide them with the capacity to develop their own technology.[1]

There were a few private businesses in Indonesia that were fairly successful in innovating on their own but the vast majority of private sector companies, particularly those controlling the product manufacturing markets, failed to develop in-house R&D capacity. This was different from the experiences of East Asian developmental states in which the relationship between the state and private corporations encompassed scientific research and technological innovation. For example, the Japanese government was remarkably able to influence private corporations down to their strategies in developing technology. This is evident in the role MITI played during its heyday in formulating economic policies that functioned to encourage private corporations to enhance organizational capacities for technological innovation (Okimoto 1990). In Indonesia, the New Order successfully established environments whereby large private corporations grew rapidly. However, when it comes to technology development, unlike the case of Japan with its *keiretsus* and South Korea with its *chaebols*, state interventions did not materialize into the strengthening of technological capacities of private industries that would by and large enhance national competitiveness. Although the New Order government had created a policy instrument, namely the divestment policy issued in the mid-1980s, that was meant to spark technological innovations in private-owned industries, it miserably failed due to the absence of strong incentives and government pressure.[2]

Nevertheless, Suharto had not fully expected private conglomerates to turn into technological giants in their respective industrial fields. He was prone to believe that technology development ought to be the domain where the state played a pivotal role due to the risks private players were not ready to take. He then allowed the private sectors to function more as growth boosters rather than centers of technological progress. One plausible explanation to this line of thought is that private-owned major industries were deeply embedded in the rent-seeking structure of the New Order political economy, that it would take uneasy efforts for Suharto to reconfigure it in such a way that technological innovation became the focus of attention. These industries enjoyed privileges of business from Suharto but they also served to generate levies for the regime. Such a rent-seeking character was certainly incompatible with business environments that emphasized technological innovation. As a result, the New Order private conglomerates appeared reluctant to invest in scientific and technological research as they were grown in this non-competitive environment. This is the root of what many industrial observers in Indonesia bemoaned as "merchants mentality," for the big businesses aimed only to grab short-term profits from selling imported products rather than create their own.

As Suharto was aware that technological development was not listed as the main interest that conglomerates were keen to pursue, he suggested that Habibie initiate the venture into technological development by harnessing what the government already possessed: the full access to intervene, namely state-owned industries. Suharto convinced Habibie that this group of industries provided Habibie with adequate resources to generate an embryo of high-tech enterprises under the full management of the state.[3] Although plans to build completely

brand new firms were present, it occurred to Habibie and his engineering team that Suharto's proposition made more sense. Moreover, that non-state economic players were unprepared to embark on a high technology adventure was another factor prompting the Habibie group to stick with existing state-owned corporations. When they arrived in Indonesia in the mid-1970s, the private sector was about to grow. Placing the advancement of technology on the shoulder of private corporations was not advisable. Since the private sector would take a long time to adopt technological innovations produced by BPPT, quick measures to develop national capacity in technological growth were placed on state-owned industries. This was the rationale behind the decision to form the Managing Agency for Strategic Industries (BPIS), which constituted another pillar of the New Order technological state and a venue for Habibie to cultivate a small group of leading high-tech-oriented industries.

Organizing strategic industries

The notion of strategic industries first appeared when an Implementing Team for the Management of Strategic Industries (Tim Pelaksana Pengelola Industri Strategis/TPPIS) was formed in the early 1980s. Established within BPPT, this task force aimed to select and propose a small group of state-owned corporations which had the potential to be developed as high technology-based industries. This task force was in fact preceded by an Assessment Team of Defense Industries (Tim Pengkajian Industri Hankam/TPIH), also facilitated by BPPT, which laid the foundations for the clustering of strategic industries.[4] The title clearly reflected Suharto's early interests in acquiring defense technology. Being a general, it is no doubt that Suharto was passionate about mastering high technology that ultimately enhanced Indonesia's military power. Thus, BPIS was initially designated to take over four manufacturing plants in the possession of the Armed Forces.

As mentioned earlier, rather than starting from zero using state funds, Suharto asked Habibie to generate a pool of industries equipped with high technology capacity out of existing industries. He advised his research and technology minister to begin with industrial infrastructures owned and operated by the military on the grounds that these manufacturing facilities, though still very modest, were perfect to be transformed into an Indonesian version of an industrial-military complex. This plan at first did not please Habibie because he was afraid the military would raise resistance against his takeover; given his unfamiliarity with ABRI, dealing with military officers was the last thing Habibie would expect to do. But Suharto guaranteed his minister that no substantial difficulties would emerge in placing those industries into his hands.[5] As the Supreme Commander of ABRI, Suharto did have the power to summon every branch of the Armed Forces to transfer its business to his most trusted lieutenant. After being convinced, Habibie and his team proceeded unequivocally with the plan. The first industry Habibie acquired was Lembaga Industri Penerbangan Nurtanio (LIPNUR), which constituted the most strategic industry for the New Order.

Located in Bandung Air Force Base, LIPNUR was then a small workshop founded by Captain Nurtanio in the late 1940s. Before the Air Force handed it over to the Habibie team in 1976, LIPNUR was running out of vitality and had nearly been closed down due to financial troubles. As the following chapter will show, within the next 20 years Habibie turned this industry into the hallmark of high technology development that strikingly signified the presence and achievement of the New Order technological state. Several years after the acquisition of LIPNUR, another three military-related firms followed suit; these included Penataran Angkatan Laut (PAL), Perusahaan Industri Angkatan Darat (PINDAD), and Dahana. Similar to LIPNUR, Dahana was owned by the Air Force, while PAL and PINDAD belonged to the Navy and the Army, respectively. PAL was then hardly an industry. It comprised of a maintenance dockyard in Surabaya operated by the Navy before it was converted into a large-scale shipbuilding industry under the Habibie leadership. On the contrary, PINDAD and Dahana were quite different. They were already relatively well-developed companies that manufactured products primarily for military purposes. PINDAD started as a military equipment factory in Bandung during the colonial period. After independence, it was nationalized and began to produce weapons and ammunition. Similar to LIPNUR and PAL, PINDAD underwent massive expansions after Habibie's team joined this company, which ignited developments of new products, most notably the assault rifle SS1. Dahana started as a dynamite plant in the Tasikmalaya Air Force Base before it switched to producing explosives used in oil, mining, and construction sectors. With the exception of Dahana, Habibie plunged himself into the management of these military-related industries by becoming president director in each company.

Suharto was not fully satisfied with the integration of all the military-related companies under the umbrella of the strategic industries cluster. He wanted more industries to be incorporated. This coincided with Habibie's primary interests in strengthening technological resources for civilian sectors. As it developed over time, the cluster expanded outside the military business to cover another six state-owned firms run by different ministries. The first of these commercial industries was Krakatau Steel, which was controlled by the Ministry of Industry. Located in Cilegon of the Banten Province, this industry was founded by Ibnu Sutowo in 1970 using a large amount of petro-dollars;[6] it is now the largest integrated steel manufacturer in Southeast Asia. The reason to integrate Krakatau Steel into the strategic industries group was fairly evident. Being the only steel producer in Indonesia, this industry provided basic raw materials such as steel and iron, which were indispensable for the production of many kinds of high technology that Habibie and his team had envisaged. The next addition was BBI, Boma Bisma Indra, a general engineering company that produced power generators, agricultural machinery, and pump sets. Also owned by the Ministry of Industry, this company originated from a merger of three smaller companies established by the Dutch before the Sukarno government nationalized them in the 1950s. Another company that was transferred from the Department of Industry was Barata. Previously located in Surabaya before moving to Gresik, East

Java, Barata concentrates on heavy equipment and metal works. Like BBI, Barata was formed through a merger of three companies whose origins dated back to the colonial period in the early twentieth century. Completing this group of industries that displayed core competence mostly in mechanical engineering was INKA (Industri Kereta Api), the sole railcar manufacturer in the country. The company grew out of a small steam locomotive workshop in Madiun, East Java, that was operated by the Ministry of Transportation, mostly serving the Indonesian railways. After being handed over to BPIS, INKA commenced the development of new railcars, emphasizing the needs of middle class passengers.

The aforementioned industries encompassed four technological fields, namely military, transportation, mechanics, and material. They were regarded as extremely important for the New Order's plans of developing state capacity in high technology advancement. However, Suharto thought that one crucial element was still missing in the configuration of this group of strategic industries. He then prompted Habibie to subsume two more state-owned technology-based firms that had great potential to make progress in the field of electronics. These were INTI (Industri Telekomunikasi Indonesia) and LEN (Lembaga Elektronika Nasional); both are based in Bandung. The former was a major telecommunication industry previously owned by the Ministry of Tourism, Post, and Telecommunication with the main concentration on switching technology. LEN was the only strategic industry that originated from a LIPI research center and it was incorporated into BPIS to develop electronic components for signaling and weapon systems. The integration of INTI and LEN marked a complete composition of industries that constituted a wide range of technical competence BPIS was set to acquire and enhance under state control.[7]

Despite strong favor from Suharto himself, the institutionalization of BPIS was not straightforward. It took a few years to take shape as a special body within the New Order bureaucracy that oversaw a group of state-owned industries considered to be strategic. This was not an effortless process. Disagreements and discontent marked the attempt to integrate the so-called strategic industries under Habibie's jurisdiction.[8] It is public knowledge that state-owned firms were no more than "cash cows" serving the interests of well-positioned bureaucrats and military officials. When Habibie collected all strategic industries under his jurisdiction with political assistance from Suharto, feelings of discontent spread among some ministers and the Armed Forces generals towards Habibie. Tensions escalated when it was stipulated that Habibie would not only obtain the chair position of BPIS, but also the directorship of IPTN, PAL, and PINDAD. Despite frictions with other ministers and military officers, Habibie's position remained strong. With pressures drawn directly from Suharto, all the ministries and the branches of the Armed Forces reluctantly transferred the management of their strategic firms to BPIS.[9] This integration process began to materialize between 1983 and 1984 when the Advisory Council of Strategic Industries (Dewan Pembina Industri Strategis, DPIS) was formed. The council was headed by Suharto and composed of seven ministers. At this point, eight state-owned companies were relocated under the supervision of DPIS: IPTN,

PAL, Dahana, PINDAD, Krakatau Steel, Inka, Inti, and LEN. As stipulated in the presidential decree that formalized the presence of DPIS, the chief objective of the council was "to coordinate the planning, implementation, cultivation, and management of strategic industries." To help the council carry out its duties, a secretariat was set up with Habibie as the executive chair. The secretariat was tasked with coordinating meetings and discussions between related ministries and offices, and setting up plans for enhancing R&D capacities in each of the industries. After a few years of operation, the secretariat turned out to be ineffectual. Lack of authority and inadequate resources seemed to be the root cause of its inability to direct the firms owned by different ministries. Feeling that the secretariat had no institutional weight to undertake a hefty mission, Habibie persuaded Suharto to elevate the stature of the secretariat so that the necessary resources and authority were provided to accomplish its tasks. As he remarked, "To carry out these programs, it is necessary to have a sound institutional arrangement in order to provide sufficient infrastructures and human resources."[10] Suharto granted his approval. In 1989, the Secretariat of DPIS was converted into the Managing Agency of Strategic Industries to be known as BPIS. The role of this managing agency was two-fold. First, it "is expected to produce high quality international goods." Second, "it is hoped to stimulate the growth of various business fields, both by the private and the government."[11]

The membership of the agency grew from seven to nine ministers, including the Minister of Industry, Minister of Defense and Security, Minister of Transportation, Minister of Finance, Minister of Post and Telecommunication, Minister of State Secretary, State Minister for National Development Planning, and the Armed Forces Commander-in-Chief. The number of strategic industries was also increased with the integration of Barata and BBI. At this point, all the strategic industries had officially converted into fully commercial enterprises whose management was closely monitored by BPIS. The upgraded status granted to BPIS was meant to enable the agency to accomplish two goals. One is "to coordinate the execution of the management policy for strategic industries integratedly," the other is to "supervise the programs" executed by the strategic industries. Accordingly, BPIS had access to coordinate interactions, make decisions, and give directions to all the strategic industries despite each one having its own management. Over the course of two years, BPIS gradually evolved into a special governmental agency whose function came to resemble that of a holding company: it controlled the corporations' financing, corporate management, human resources, and most importantly research and development policy.[12]

State-directed innovation

It came as no surprise that soon after its official inception, BPIS became the venue for Habibie-led engineer technocrats to turn the strategic industries into the spearheads of robust production of high technology. This array of technologically oriented corporations recruited hundreds of engineers who were sent to

study abroad under BPPT scholarship programs. This young generation of engineers were placed either in R&D or manufacturing sections of BPIS corporations; a few of them became managers and later joined BPIS. In running BPIS, Habibie was assisted by four deputies, including two of his fellows whom he had hired during his tenure at MBB. They were Surasno Paramajuda as Deputy of Planning, and Sutardi Suparlan as Deputy of Technology. Martiono Hardianto, an engineer by training who worked for the Ministry of Finance for years, was placed as Deputy of Finance, while Wisnu Broto, trained in psychology, served as Deputy of Administration and Human Resources. Habibie had very limited time to oversee BPIS on the daily basis. The multiple appointments he held at once obviously did not permit him to be full-time at BPIS. Due to this time constraint, Habibie delegated most of the handling of BPIS to his vice chairman. Consequently, this crucial role was given to Giri Suseno Hadihardjono.

A dexterous engineer and skillful negotiator, Hadihardjono was the linchpin of BPIS and played an important role during the period of its rapid expansion. Hadihardjono finished his undergraduate education in mechanical engineering at ITB before he went to the University of Michigan in the United States to obtain a master's degree in the same field. Upon his return to Indonesia, he joined ITB as a faculty member and years later he completed his doctoral degree there. In 1973, Hadihardjono was assigned a post at the Ministry of Transportation where he built his bureaucratic career for almost 20 years. He led the Directorate General of Land Transportation before Habibie asked him to join BPIS as vice chairman to replace Agus Suyono, who had been part of the council from the outset. Hadihardjono was officially named BPIS vice chairman in 1991 and occupied this position until the termination of the agency following the fall of Suharto. Being a committed engineer, Hadihardjono shared Habibie's grand vision and was very keen to transform BPIS into an engine of high technology industrialization. During his tenure at BPIS, Hadihardjono demonstrated not only his engineering skills for making technical decisions but also social skills to overcome problems that resulted from squabbles, particularly with military officers. This occurred when BPIS began to face subtle resistance from the military officers pertaining to the handling of military-related industries by BPIS. It was quite evident that the military remained unhappy with Suharto's decision to have Habibie take over its business. Habibie had worried that such unpleasant confrontations would emerge. When tensions started to practically slow down the pace of BPIS's attempt to synchronize productivity in all military-related firms, Hadijardjono approached the military using personal connections. Hadihardjono had graduated from the *Lembaga Ketahanan Nasional* (National Resilience Institute), widely known as Lemhanas, where all high-echelon civilian bureaucrats and military officers are trained prior to placement in a higher rank. One of his colleagues from his training happened to be the Army chief of staff. He then offered a position to his army friend in PINDAD as Board Commissioner and persuaded him to come to terms with BPIS authority. The offer was taken without hesitation. He gave the same offers to the Navy and the Air Force in PAL and IPTN, respectively. As with Dahana, the offer went to the secretary

general of Ministry of Defense and Security. This strategy worked very well as having military officers on board ended the troubled relations between BPIS and the military. Later on, Hadihardjono employed the same strategy using his ITB networks to persuade corporate decision-makers in non-military strategic industries who mostly graduated from ITB.[13] These inter-personal networks provided a channel through which Hadihardjono was able to build a solid alliance with high-level engineers and military officers that underpinned BPIS's crucial function to lead the wide-spanned management of the strategic industries.

Yet, what gave BPIS an extended reach into every single of the companies lies in an uncommon scheme set up by the Ministry of Finance. Officially, all state-owned corporations in Indonesia belong to the Ministry of Finance. The proportion of ownership varies across firms but normally the ministry controls the majority of shares in state-owned corporations, thus being chair of the commissioner board. In the case of the state-owned strategic industries, a special arrangement was made in which the Ministry of Finance delegated its legal rights in all ten strategic industries to the BPIS vice chairman. Accordingly, Hadihardjono held the chair position of the commissioner board in each of the companies, resulting in a deep penetration of BPIS into all strategic industries. This allowed BPIS to act as if it were a mother company and to directly intervene in the decision-making process on a daily basis. Such an organizational structure effectively accelerated the process of enhancing technological and productive capacity within BPIS organizations. A considerable increase of government investment in the strategic industries during its early years was another privilege BPIS exclusively enjoyed during the New Oder era. Thus, while the government decided not to increase its investment in most of state-owned industries that were in need of more capital, the Ministry of Finance stipulated that BPIS companies were treated differently.[14] With strong authority drawn from the head of the state enforced by an extended reach down to individual corporations, BPIS plausibly encountered no difficulties in establishing a system of centralized management with intensive monitoring power, which was extremely important to reach what constituted the primary goal of strategic industries: "To become the spearhead in transforming Indonesia into a modern country by mastering science and technology for the sake of development."[15] This goal clearly reflected what the New Order technological state was intending to achieve in which the state played a pivotal role in the production of high technology and in the utilization of technological innovation in industry. Thus, BPIS stood at the center of these processes whereby accelerated transformation and technological supremacy were accomplished at once.

To make sense of the significance of BPIS's role in this mode of industrial development, it is worth looking at the size and scale of the strategic industries as a whole and the impact of what BPIS had fashioned to advance technological capacities of the strategic industries. This involves assessing two features that confirm the extent to which the strategic industries underwent rapid growth and robust production of technology under the coordination of BPIS. These include manpower and technological outputs. In 1980, the total number of employees

hired by the strategic industries combined equalled 13,186. PAL was then the largest employer with 5,138 workers, followed by Krakatau Steel and IPTN with total employees of 3,816 and 3,162, respectively. Five years later, the total number had tripled to 36,824. The highest increase occurred at IPTN. Due to the development of CN235 and N250 (see the following chapter) at that point, IPTN hired 12,400 workers, mostly at the manufacturing plants. A steep rise of employment was also present in PINDAD and Krakatau Steel, which reached 5,357 and 6,121, respectively. By 1995, the number of workers employed by the strategic industries mounted to a total of 42,360, with IPTN as the largest employer with 15,651 workers, followed by Krakatau Steel with 6,825. Other BPIS firms also experienced steady growth though the numbers of employees were lower than those of IPTN, Krakatau Steel, PAL, and PINDAD. Compared to other state-owned corporations outside BPIS, the expansion of the strategic industries in terms of employment was incredibly high and unrivaled. All workforces combined made BPIS the largest group of state-owned corporations in Southeast Asia. This simply proves the rationalization the engineer technocrats put forth that rapid industrialization of high technology entails high growth in employment.[16]

The sheer size of the workforces in the strategic industries, however, was merely an effect of another purpose that pro-high technology bureaucrats adamantly had argued for. What was more important and more strategic according to this view lay in the role of BPIS in sparking technological innovation in every unit of the strategic industries cluster under state directions. BPIS acted like a big R&D corporation and its relationships with state-owned strategic industries opened a direct link to a wide range of technological and industrial infrastructures that had been set to deepen technical knowledge production and industrial innovation. Carrying out this remarkable duty, BPIS aimed to facilitate an array of technological innovations and industrial developments conducted within the strategic industries and the accomplishments of these projects in turn reinforced the position of the agency in absorbing more state-drawn capital to expand even greatly. How BPIS managed to pool scientific and technological resources, including Indonesia's best scientists and engineers, and to transform state-owned corporations into a hotbed of technological advancement merits attention here. It requires a brief observation of the diversity of large-scale projects across BPIS companies, highlighting a few strategic technological products whose development was coordinated and organized by BPIS. The largest and most significant of this cluster of strategic industries, it should be noted first, is the Indonesian Aircraft Industry (IPTN). The two following chapters will discuss in greater detail how this strategic industry rapidly grew and became the breeding ground for world-class engineers and high-tech infrastructures. Two multi-billion dollar high-tech projects successfully carried out by IPTN engineers drew much public praise: CN 235 and N250. Another set of large-scale projects was executed by PAL in Surabaya. Vastly improved after being taken over by Habibie, this shipyard set off to produce modern ships for defense purposes before it expanded to build a line of products for commercial use. It first developed its technological

capacity by purchasing license from foreign counterparts such as Boeing of the United States, Wartsila of Norway, and Mitsubishi Heavy Industries of Japan. It took only a few years before PAL engineers mastered the skill and knowledge to construct a variety of ships such as 2,500-ton frigates, 1,200-ton submarines, 600-ton mine-hunting ships, and fast patrol boats; these were to fulfill the demands of the Navy. Of most importance on the PAL list of indigenously designed products was Palindo Jaya 500 PAX, a medium-sized passenger vessel specially designed to commemorate Indonesia's fiftieth anniversary in 1995. Another BPIS company worth noting is PINDAD. Likewise IPTN and PAL, PINDAD was another BPIS company under direct control of Habibie as president director. The phenomenal growth of this military industry merits attention, as it contributed a considerable portion of technological development to the entire cluster of strategic industries. Different sorts of military weapons and equipment were manufactured by PINDAD, but the most regarded achievement was the assault rifle SS1, which was locally designed by PINDAD engineers to be suitable for the specific needs of Indonesian soldiers. Large caliber munitions and special munitions such as mortar grenades, explosives, and detonators were among PINDAD product lines. Although it bears a strong military image, a greater proportion of productivity in PINDAD, however, aimed to manufacture engineering products for civilian purposes. PINDAD had developed a core competence in civilian technology that included machine tools, energy equipment, and transportation. It was involved in several projects with other BPIS companies, e.g., INKA (electric train construction) and IPTN (manufacturing facility and component production). Another BPIS company worth mentioning is LEN. As noted earlier, LEN was the only company in BPIS that had its origin from a research unit in LIPI. It was founded in 1965 with a focus on development of electronics, electrical power, and components. Although it was set up as a research and development facility, over 15 years LEN managed to convince the government of its ability in electronics manufacturing as demonstrated in several government-funded projects. In 1980, LEN then expanded to research and production of telecommunication products and was able to establish a small-scale manufacturing facility. When LEN was officially transferred to BPIS in 1989, it turned into a profit-making industry with a strong emphasis on electronics and telecommunication aimed for various needs, including railway signaling and weapon control systems.[17] The latter started when the Indonesian Navy had a torpedo control malfunction in one of its vessels. BPIS then dispatched a team from LEN to investigate the cause. The LEN team came up with a locally designed device that successfully fixed the problem. The Navy was impressed.[18] After that, LEN began to engage in the development and production of electronic instruments for military uses, which has hitherto remained one of the major business activities in LEN.[19]

In addition to technological developments executed by the strategic industries, there was one special project BPIS carried out under its direct supervision. It was to create the so-called national car designed for middle class Indonesians with an affordable price. Habibie came up with this car project as a response to a

question addressed to him by parliament as to why Indonesia did not produce its own cars while bothering to build aircraft.[20] To this end, Habibie thought that constructing new plants was unnecessary. Instead, BPIS was designated to execute the plan and to use manufacturing facilities in all strategic industries. Major parts were to be produced in PINDAD and INKA, while IPTN was in charge of final assembly. The car project was named Maleo; a rare bird only found in Sulawesi. A design team from IPTN and PINDAD closely collaborating with a Melbourne-based design firm was assigned to conceive Maleo and take it from the drawing board to the production plant. Habibie had planned to launch Maleo in August 1995 as part of Indonesia's fiftieth anniversary of Independence celebrations along with other technologies produced by IPTN, INKA, and PAL.[21] Yet, Maleo never made its public appearance after Suharto unexpectedly decided to terminate the project and shifted the national car project to the one proposed by his own son, Tommy Suharto.[22]

Technological nationalism

The idea of integrating state-owned corporations under one managing agency was then barely unprecedented. A few governments had had this sort of state agency under which state-run firms were controlled in order to achieve productive and efficient outcomes. In fact, BPIS was admittedly modeled after Spain's *Instituto Nacional de Industria* (INI), founded in 1941. The INI model was introduced to Indonesia through a close connection between Indonesia and Spain in airplane production (discussed in the following chapter) during the 1970s and 1980s. INI came to inspire Habibie and his team after they learned the success story of this institution in accelerating Spanish industrial transformation.[23] Although the model originated from abroad, the organizational feature of BPIS differed from INI as the political and economic settings of the New Order molded the extent of its authority and goals. Situated in Asian development,[24] the BPIS model appeared to be one of its kind in which state-owned corporations were fully geared towards the accomplishment of technological progress. Arguably, similar agencies may not be found elsewhere in Asia and this is due to a different developmental trajectory and institutional structures that constituted Indonesia's technological state. Understanding the role of BPIS as a *sui generis* body within the New Order bureaucratic structure requires unpacking the meaning of the "strategic industries" that embodied the authority of this agency. What does "strategic industry" mean in this context? There was a heated debate on the definition of what constitutes "strategic" and in fact it stirred confusion among policymakers and technocrats as to what criteria the New Order government employed in selecting which industries were to be included in the cluster. We may dodge the perplexity in the term by sourcing the meaning of "strategic" from Suharto and Habibie, the two most influential persons behind the formation of strategic industries. It should be noted that both came up with different interpretations of this term. The term originally was Suharto's. He mentioned the concept of strategic industries when Habibie and his team commenced the task

of building basic infrastructures for high technology-based industry in the mid-1970s. In Suharto's view, "strategic" refers mostly to defense and security sectors. Suharto's inclination toward military interests in strategic industries comes as no surprise. In the early stages of the New Order technological state formation, Suharto considered high technology as an indispensable instrument to reinforce the military capacity of Indonesia as the largest country in Southeast Asia. He stressed this point:

> It is time for us to establish an agency which is able to develop our national defense and security industries together with strategic industries so that our technology, productivity, and efficiency will mutually support each other *to enhance our national defense*.[25] [emphasis added]

However, the meaning of strategic industries associated with military power gradually shifted toward aspiration to the supremacy of high technology. Influence from Habibie was evident in this change of view as Suharto succumbed more to Habibie's technological vision than inputs from the military. When the institutionalization of BPIS was near completion, Suharto had fully accepted the meaning of strategic industries as defined by Habibie, although the military element remained prevalent in R&D programs organized by BPIS within the strategic industries.

The conflation of two meanings, defense and high technology, in the strategic industries had greatly leveraged the way the Habibie group was able to control large-scale industries that employed around 43,000 workers with a total asset of US$16 billion (in 1999). Holding the BPIS chair along with directorships of IPTN, PAL, and PINDAD, Habibie had turned into the most powerful bureaucrat cum businessman that no one in the New Order government could match. Yet, such incredible power in both authority and the amount of state capital controlled was by no means unquestioned. Ever since BPIS had officially started, criticisms were addressed towards Habibie's one-man-show in strategic industries and the likelihood of the strategic industries to effectively accomplish its tasks. Some even questioned the necessity of pooling a number of state-owned corporations in the hands of the Minister of Research and Technology, a portfolio that was supposed to cater for research institutions rather than commercial corporations. The criteria for selecting strategic industries were also placed in the spotlight. In an editorial piece in July 1993, *Tempo* magazine critically noted that the basis of selection was arbitrary and vague; a few BPIS companies had less management experience and had not yielded profits significantly. *Tempo* also pointed to the unclear line between the functions of industrial production and of R&D in BPIS's activities.[26] More importantly, *Tempo* highlighted, the source of criticism from many economists lays in a combination of a vast amount of subsidy and of market protection from which BPIS companies benefitted, with full assurance from Suharto. Estimates claim that the government had spent US$2 billion a year on improving technological capacities of the strategic industries, an amount larger than Indonesia's debt to the World Bank during the

same period. A large proportion of this subsidy went to funding R&D activities, training engineers, and purchasing expensive high-tech equipment. Worrying about the negative impacts of BPIS on the economy, CSIS economist Marie Pangestu feared that the presence of BPIS "is likely to result in a protectionist policy while its product cost much higher [than market prices]."[27] To Pangestu and many economists who shared her market-minded view, a range of facilities the New Order government granted to BPIS-directed firms warranted meticulous examination because not only that the government investment on high technology R&D was risky, it potentially damaged business environments that were supposed to be based on unfettered competition. Giving ample facilities only to a small group of corporations would entail discrimination against the rest and could amount to disruption in the market. These economists were even more concerned about the consequences of cultivating strategic industries that relied severely on political connections, which according to economists' predictions could result in a weakening industry structure.[28] Such critical commentaries might not be far-fetched. Taking a closer look at how the New Order government overindulged BPIS corporations with excessive facilities, particularly market protections, this allegation seemed to be true. Indeed, the government had launched a policy to secure a captive market for products of BPIS companies. For instance, the Armed Forces, domestic airliners, and domestic sailing companies were strongly recommended to purchase products from IPTN and PAL. The government even went further by prohibiting importing products with similar specifications of those produced by these two strategic industries. Purchasing used airplanes and boats was strictly disallowed despite lower prices, while BPIS companies were exempted from obligation to purchase domestically produced articles. Concerns over Suharto's decision to fully favor Habibie's strategic industries at the expense of market stability were also addressed, though implicitly, by the World Bank. In its 1993 report entitled *Indonesia: Sustaining Development*, the Bank evaluated the budget allocation by the New Order government and specifically made mention of Indonesia's ambitious plans of becoming a producer of high technology. The report wrote, as quoted by *Tempo*, "a policy centered on technological leapfrogging involving high-tech-based industries using public investment or subsidy and protection in many countries has proved ineffective and too costly."[29] Furthermore, the Bank regarded Indonesia's high technology-oriented development policy as inconsistent with its long-term strategy of sustaining the growth of economic sectors that yielded large employment. At the time, Indonesia's productive population soared to over 70 million, a number that was too big for strategic industries to take up.

Habibie took a defensive stance against all the criticisms, particularly what the World Bank had insinuated. He told the press, "Indonesia is not obliged to comply with every single suggestion from the World Bank."[30] He even returned criticism to the Bank by pointing out the decision the New Order government had made in the early 1970s to build fertilizer manufacturers, of which the Bank had disproved yet it turned out very useful for the country to achieve food self-sufficiency. To those who questioned the selection criteria of strategic industries,

Habibie took cover in Suharto, stating that it was the president who made the selection;[31] hence the decision was unquestionable. Responding to fear that BPIS only rendered Indonesia a protectionist economy, pro-Habibie technocrats came to defend the protection policy by arguing that no government is neutral when it comes to developing high-tech-based industry. Protection is always necessary, they highlighted, otherwise the strategic industry will fail; what matters is how long the protection ought to last.[32] For this, Habibie pledged to make the strategic industries competitive in global markets within 15 more years of protection.[33] In a similar vein, Ginandjar Kartasasmita, who was named head of BAPPENAS replacing Widjojo-linked Saleh Afif, backed up Habibie's argument. He was adamant that Indonesian development required a long-term vision in which high technology constituted the core of national competitiveness in the future.[34] He essentially shared Habibie's developmental vision in justifying large public investment in high technology, which was largely facilitated by BAPPENAS after Kartasasmita took over the agency from the economists' control. He vindicated his support when he wrote: "Our lag behind other countries in terms of national incomes reflects our backwardness in science and technology. Consequently, we place science and technology at the core of our development strategy."[35]

All disproportionate advantages in forms of subsidy and protection the New Order government bestowed upon BPIS corporations should not be taken simply as a matter of a policy choice that can be assessed in economic calculations of cost-benefit terms. Neither should it be examined against the market rationality applauded by the economists, which gives weight to liberalized mechanisms. This industrialization scheme was deeply rooted in the logic of the technological state that resorts to a different paradigm of technocratic rationality and developmental trajectory. Given the sheer scope and level of high technology industrialization as implemented by BPIS under the Habibie leadership, a salient assessment should be linked to the ideological foundation of the technological state that warranted and justified all necessary measures and financial backups drawn from the state. It has been discussed earlier that the New Order technological state was interested not merely in producing advanced technology but also in accomplishing the ideological mission of the regime as a whole, as embodied in the imagination of a modern state characterized by its ability to fulfill its own domestic needs. This is where the interplay between high technology and the politics of nationalism lies. As noted in the Introduction, the very logic and rationality of the technological state were largely registered to the cause of nationalism. This connection is epistemologically plausible if one examines the technocratic foundation of the engineers that informed the formulation of development policy, which was strikingly diametrical to that of the economists. The typical arguments the engineers repeatedly conveyed to the public as to why high technology development ought to be largely facilitated by the state were in contrast to those of market-minded economists. This contrast simply indicates an epistemological chasm that splits the two groups in the way they construe the economy as a space of development. For the economists, the

economy is a game of networks consisting of different players with different kinds of resources. Because resources are scarce, the goal of the game is to spread each player's resources through open and free markets such that production and distribution of wealth grow efficiently. Thus, the rule of the game obliges each player to open access to resources for other players and to allow capital to flow in and out without any regulatory barriers. On the contrary, the engineers uphold a metaphor of the economy as a game of war. As in warfare, there are always winners and losers. To be a winner, each player is compelled to use his/her own resources in the competition. Here the most strategic weapon in the war is technology, which accordingly defines how much power a player wields in any particular battle.

The economists do place technological variables in their equation. But they hold different epistemological assumptions about how technology is acquired. This is demonstrated in two opposing logics. While the economists ask, "Why bother to produce technology if we can simply purchase it?" the engineers reply, "Why bother to purchase technology if we can produce it on our own?" The implication of this disagreement is profound because it touches upon the role of the state, market systems, and bureaucratic structures, as well as the involvement of business organizations. The difference in arguments between the economists and the engineers comes from rationality that calculates the choice of action based upon opportunity. For the economists, choices about how to acquire technology depend on the assessment of opportunity costs. This decision-making method stems from the core of economics as a science of scarcity that continuously looks for the best among available options. On contrary, the principle of opportunity costs does not work for the engineers who view technology as the very window of opportunity for making a leap in the developmental process.[36]

With different ways of looking at opportunity, the epistemological boundary that distinguishes the engineers from the economists as regards with their technocratic paradigms lies in one ideal condition that only exists in the engineers' vocabulary, namely *mandiri*. This term was all over the discourse of technological development found in almost every text of the New Order's long-term development plan. Such a concept establishes the political, ideological, and cultural objectives of the technological state as imbued in the technocratic paradigm of the engineers. *Mandiri* literally means "independent" and it is directly linked to the imperative of enhancing the nation's technological capacities specifically deemed as a means to have a control over natural resources. As Habibie remarked, "Mastering and developing technology are very important. Without it, our rich natural endowment would never be under our own control."[37] In this view, an independent nation is one that strives to solve its own problems by relying on the creation of its own technology.[38] Furthermore, the concept of mandiri places technology as a strong indicator of national independence. This is clearly expressed in the way Habibie juxtaposed nationalism to economy. He noted, "Nationalism is much broader than the necessary conditions of political independence. In the economy, nationalism refers to the capability of producing goods and services for our own needs."[39] Adding the symbolic element, he

further argued, "The mastery of high technology enhances our competitive advantages in the future, which will uplift the dignity, prestige, and prosperity of Indonesian people."[40]

In sum, BPIS was more than just a façade of profit-driven corporations. It was part of the pursuit of *mandiri* signified by massive efforts to improve national capacities in producing high technology. For it is firmly associated with a state of self-governance, self-sufficiency, and self-determination. Thus, the materialization of high technology in development became an ingredient of nationalist rhetoric that fueled the engineers' technocratic worldview. This eventually turned the New Order development policy into an arena of contestation about modernity. While the economists associate modern conditions primarily with growth and capital accumulation, the engineers insist that modernity is a condition of being technologically independent. No programs of high technology development demonstrated the materialization of such a conviction more astoundingly, more lavishly, and more massively than what the New Order was determined to accomplish in IPTN. The following chapter illustrates how this aircraft industry was founded and nurtured by the New Order, and evolved into one of the most ambitious technological projects in the developing world.

5 Accelerating transformation

Technique causes the state to become totalitarian, to absorb the citizens' life completely.

Jacques Ellul

The preceding chapters have highlighted three major interrelated features, namely the elite power relations revolving around Suharto and Habibie, the technological bureaucracy underpinned by a particular technocratic epistemology, and state-operated strategic industries, all of which underlie the formation of the technological state in New Order Indonesia. This chapter and the next are intended to move the discussion to a micro level, which unpacks the finer details in the operation of the technological state right at the heart of industrialization process taking place during the reign of the New Order. The case in point here is Indonesia's aircraft manufacturer, IPTN, which is the flagship of all the high technology projects the New Order tenaciously pursued. As extensively discussed in the prior chapter, IPTN was not the only strategic industry that absorbed enormous political, financial, and techno-scientific resources the New Order regime was highly optimistic to supply. Yet, of all large-scale, capital-intensive technological adventures demonstrated in the New Order period, IPTN was undoubtedly the ground zero of Habibie's expensive experiment of high-tech-based industrialization. There are three reasons why the case of IPTN is worth focusing on in the account of the New Order technological state. First of all, Habibie's formula of accelerated transformation was based on the assumption that high technology is effective in increasing the speed of industrialization and was mostly translated through state-directed programs in IPTN. Thus, IPTN embodied the entire logic of high-tech-based development. Second, IPTN represented the most strategic industry as it involved the three most significant aspects in the New Order state's interests: high-speed transportation, defense and security, and high technology acquisition. It comes as no surprise that the operation of IPTN to a certain degree was shrouded with secrecy and generally kept from public accountability. Last but not least is the fact that IPTN had for two decades functioned as a way to display what the New Order had achieved in high technology production. The remarkable outcome of such a high-tech display resulted not only in the garnering of admiration from foreign visitors,

particularly governments of Islamic and developing countries, but also more importantly it reinforced the basis of legitimacy of the New Order. As I argued in the Introduction, the formation of the technological state is characterized by the pursuit of technological supremacy, which was meant to become a new foundation of legitimacy for the New Order authoritarianism. This chapter delves into the three aforementioned features intertwined in the narrative of high technology and modernity; it seeks to reveal how the socio-technical transformation was accelerated in such a way as prescribed in Habibie's distinctive formulation of high-tech-based development. By the same token, this chapter also presents a critical examination of the way this accelerated transformation was carried out. It addresses a series of cultural and organizational issues that plagued the micro management of high technology production in IPTN.

Legacy of the aviator

There are two differing narratives that exist pertaining to the historical roots of the aviation industry in Indonesia. One is the famous story that emphasizes the role of Habibie and his group as the major actors in building Indonesia's high-tech aircraft manufacturer. This narrative places the moment when Habibie returned to Indonesia from Europe as the starting point for the Indonesian aviation industry. The other story rests on the view that long before Habibie and his group acquired technical knowledge in aircraft construction abroad, there had been a small yet significant endeavor to develop an aircraft manufacturer undertaken by three engineers in the Bandung-based Air Force squadron. Nevertheless, these two narratives are historically related and ideologically interconnected. Hence, an account of the New Order's efforts to build an aircraft manufacturer should start from the latter, resulting in the continuity of the narrative of technology across these periods.

Aviation history in Indonesia started from the colonial period. It dates back to 1914 when the Netherlands East Indies government created *Proef Vlieg Afdeling* (Experimental Aviation Division) in Surabaya, East Java, for a simple mission: to adjust the materials from European-made airplanes so that they could be used in a tropical climate. After realizing the significance of airborne warfare during World War I, the colonial government created *Technische Dienst vd Luchtvaart Afdeling* (Division of Aircraft Engineering Affairs) in Sukamiskin, West Java, in 1923. This organization was intended to assemble various types of fighting planes and to modify their flight arsenals so as to adjust them to the tropical environment.[1] A year later, this facility was moved to Andir (now Husein Sastranegara Airport) in Bandung and its capacity was expanded to include the design and manufacture of light training planes. This was the first time the Dutch engineers had trained local technicians, who later became involved in the aircraft design process.[2]

During the Japanese occupation from 1942 to 1945, the facility in Bandung entered a brief hiatus. Only a small part of it was used by the Japanese to operate their fighter planes. Japan's unconditional surrender to the Allies in August 1945

led the newly formed republican state of Indonesia to take over the Japanese arsenal. One year later, the Indonesian Air Force was formed and inherited the airplane facility in Bandung. With old rusted production tools and a small number of planes left by the Japanese and the Dutch, the Air Force gradually developed its arsenal and sought to produce its own aircraft. The idea to construct airplanes was first pursued by three fellows of a local junior aero club who initially expressed the idea of creating Indonesian-made aircraft. They were Nurtanio Pringgoadisurjo, Wiweko Soepono, and R.J. Salatun[3] who joined the Air Force's Flight Office in Yogyakarta. They were primarily concerned with the fact that the Air Force airplanes depended upon imported parts. Due to the economic and political situations at the time, it was difficult to acquire those parts from their producers. Thus, producing locally made airplanes would reduce this dependency. A preliminary effort was undertaken in 1946 when Nurtanio and Wiweko designed and built a glider called NWG-01 entirely from local materials. The glider flew successfully and caught the attention of the Air Force officials who then agreed to make a small batch production of the glider for training purposes. Two years later, Wiweko proceeded to design a modest airplane using a Harley Davidson motor. The plane was built with a mix of wood and metal materials. Named RI-X, this was the first motor-powered plane made by an Indonesian.[4] After Nurtanio returned from his studies in aeronautic engineering at the FEATI Institute of Technology in the Philippines in 1950, he initiated a further step toward creating a more advanced aircraft. Apart from his primary duty at the Bandung-based Air Force's Flight Maintenance Depot, Nurtanio organized a small experimental workshop assisted by a couple of technicians. The situation of Indonesia was then unfavorable for Nurtanio to pursue his dream. His tenacity, however, enabled him to overcome a multitude of constraints mainly caused by a lack of supporting facilities. Nurtanio's persistence finally came to fruition when he accomplished the creation of a single-seat combat airplane named Si Kumbang, "the Beetle."

The plane, entirely constructed from metal, was designed for counter insurgency missions aimed at suppressing regional rebellions scattered around West Java Province. On 1 August 1954, Si Kumbang successfully made its maiden flight, tested by an American pilot. In March 1957, a second version of Si Kumbang using an American-made engine was completed. Nurtanio himself tested the plane by flying it over Bandung. Fascinated by what Nurtanio had accomplished in Bandung, the Air Force high officials in Jakarta turned Nurtanio's experiment workshop into the Aircraft Research, Experiment, and Construction Depot (DPPP), officially formed on 24 April 1957. This formal status granted Nurtanio more support from the Air Force, which was necessary for him to expand his experimental workshop and to develop a variety of new airplanes. In April 1958, DPPP introduced a new product, Belalang (locust), which was a modification of L-47 Piper Cub. A year later, an advanced version of Belalang able to reach a speed of 144 km per hour was launched.

Although the Belalang project was still in its infancy, it convinced the Air Force to make an order of 50 units mostly for training programs.[5] This marked

an historical point of Nurtanio's long-term endeavor to establish an aviation industry in Indonesia. His depot was no longer a mere experiment station, but had evolved into a small manufacturer, albeit with limited resources. DPPP was able to meet the order and produced another small batch for agricultural uses. In 1958, DPPP created a sport airplane called Kunang (firefly) to fill the growing demand of the aero sport market. In addition to its production of fixed wing planes, DPPP also sought to develop a rotary wing craft called Kepik Helicopter.[6]

The Sukarno government began to show a great deal of interest in the aviation industry at the 1957 National Conference, a significant event where Air Force Chief Commander Suryadarma announced a development plan for Indonesian aviation. It took three years for the Air Force to materialize this plan. Drawn from Nurtanio's proposal, the Air Force Chief Commander then launched Decree No. 488 in 1960 resulting in the formation of an Agency of Aviation Industry Preparation (LAPIP).[7] This new agency was tasked with establishing a real aircraft industry. A decision was made to locate LAPIP in Bandung due to the fact that the city was well equipped with key resources which included Nurtanio's workshop, various supporting industries, technical schools and an abundance of labor. In 1961, the Indonesian government signed a memorandum of understanding with the Polish government to carry out a joint aircraft production project. LAPIP was afforded a loan of US$2.5 million from the Polish government to build a manufacturing facility nearby Husein Sastranegara Airport. With this grant, it started producing a modified version of the PZL-104 Wilga, named Gelatik (rice bird), with a license from Poland's Cekop. In 1965, 44 Gelatiks were manufactured for a variety of purposes that ranged from agriculture and light transportation to usage by aero clubs.[8]

In 1965, President Sukarno formed KOPELAPIP. This was the first serious undertaking of the Sukarno government to build a modern aircraft industry that would fulfill domestic needs. KOPELAPIP was provided with aid from an Indonesian businessman who maintained a close relationship with Sukarno. A political mission was subtly attached to this new organization as President Sukarno attempted to weave friendly ties with the Netherlands. Nurtanio was named a general manager of KOPELAPIP's engineering division. Located in a swampy area of Sunter in Jakarta, KOPELAPIP planned to produce a license-based version of Fokker's F27. Politically attached to Sukarno, KOPELAPIP failed to endure the political instability during 1965–66. In 1967, KOPELAPIP collapsed along with Sukarno's power.[9] Severe economic crises in the aftermath of Sukarno's downfall led to Suharto permanently terminating KOPELAPIP. After the 1965 political turmoil, Nurtanio headed back to Bandung and devoted his time to LAPIP programs.

On the morning of 21 March 1966, an unexpected tragedy occurred when Nurtanio and his friend Supadio were testing a Super Aero-45 airplane. While airborne, one of the engines suddenly shut down causing the plane to lose power. Before reaching the landing ground, the plane crashed into a building in downtown Bandung and broke into pieces. Nurtanio and Supadio were killed

instantly.[10] The tragic death of Nurtanio in the accident evoked a deep sense of grief within the Indonesian Air Force community. The Air Force head office decided to commemorate Nurtanio's legacy and renamed LAPIP as LIPNUR, the Nurtanio Agency for Aviation Industry. This transition took place at the time when the New Order regime was born. Initially, there was no connection between the two. Whereas the regime was concerned with the recovery of the economy from severe crises, LIPNUR struggled to survive. The passing of Nurtanio had inevitably affected the operation of this small aircraft manufacturer. LIPNUR continued the production of Gelatik in very limited numbers, mainly to supply the Air Force.[11] This condition of diminished vitality lingered through the mid-1970s until the arrival of B.J. Habibie.

Seizing Nurtanio

If the narrative of Nurtanio marked the dawn of the Indonesian aviation industry in the post-revolution era, revolving around the tinkering activities of the Air Force engineers in the Bandung workshop, the narrative of Habibie emphasized the role of Indonesian students in Europe in placing the first brick in the structure of the Indonesian aviation industry. As we have seen, the idea of building a modern aircraft industry in Indonesia had caught on among students in Germany where Habibie was trained as an engineer. What this group of students had in common with Nurtanio and his aero club fellows was the aspiration to turn Indonesia into an aviation powerhouse, a vision that was motivated by Sukarno in a passionate speech *Menggarudalah Bangsaku*.[12] This shows that these two generations of engineers had the same ideological roots in envisaging the role aviation played in attaining national prestige and grandeur. Habibie returned to Indonesia in 1974 after receiving a call from Suharto through Ibnu Sutowo (see Chapter 2). This marked the point from which the development of a modern aircraft industry began. Knowing that he would not be able to work alone, Habibie formed a small team of 11 European-trained engineers he had consolidated during his tenure in MBB. Among them were Harsono Djuned Pusponegoro (graduated from ITB and the first to join Habibie at MBB), Surasno Paramajuda (a graduate from an aeronautic school in Kiev, Russia, who joined KOPELAPIP), Rahardi Ramelan (an automotive engineer from Czechoslovakia), Sutadi Suparlan, Sofjan Helmi Nasution, Abdul Munaf Gayo, and Djermani Sandjaja. The latter four were graduates from Kiev who worked for a number of Indonesian government agencies before leaving for MBB.[13] As noted in Chapter 3, these engineers were to become the elite group that directed the bureaucratization of technology in the New Order government.

As a state project, the birth of the IPTN was made possible by the interweaving of political interests of three people: Suharto, Ibnu Sutowo, and Habibie. The interests that brought them together are worth noting as they shaped the initial realization of IPTN. To begin, Suharto was an enthusiast of technology. His deep fascination of high-end technology paved the way for Indonesia to move toward being a prominent technological nation. As the leading figure of the New

Order regime, Suharto's favor of high technological industrialization was mainly driven by the imagination of the New Order as a regime of modernity that would transform Indonesia into a developed society. Likewise, Ibnu Sutowo had technological ambitions. Coming from a Javanese priyayi family, Sutowo earned a medical degree in Surabaya before heading to Palembang in 1945. There he joined the Republican Army fighting the Dutch for the region's oil fields and plantations. Later Sutowo was named the Army's chief of logistics and put in charge of the Army's oil company, Permina. His close ties to Suharto, who he had known long before the New Order regime arose, brought him to lead a state oil company, *Pertambangan Minyak dan Gas Bumi Nasional* (National Oil and Gas Mining) or Pertamina, in 1968. With the vast amounts of cash pouring in through Pertamina, Sutowo eventually became the number one businessman in the country. Sharing views with Suharto on technology, development and industrialization, Sutowo was assigned to expand Pertamina's business into non-oil sectors, most notably to build a Cilegon-based innovatory steel mill, Krakatau Steel, cooperating with a German–Dutch consortium.[14] It was the common interests of Suharto and Sutowo that fueled the emergence of the aircraft industry in the New Order Indonesia.

As for Habibie and his dream team, receiving support from these two powerful men was more than enough to win approval for their proposal. As noted in Chapter 3, Sutowo enabled the Habibie group to accomplish their mission, harnessing abundant financial resources from Pertamina. The inception of the aircraft industry began in 1974 when Habibie and his team started working officially as Pertamina employees within ATTP. ATTP's mission was primarily to conceive a plan for the aircraft industry encompassing technical, managerial, and financial aspects. In planning this prestigious project, Habibie and his team did not start on their own terms. Suharto and Sutowo put forth a condition that the aircraft industry ought to be labor-intensive, complying with the macroeconomic goal of the New Order in creating employment. To fulfill this requirement, Habibie's team proposed a progressive manufacturing plant that started from small-scale production relying upon human labor rather than any system of automation.[15]

When Pertamina plunged into a severe financial crisis in 1975 due to large-scale corruption scandals implicating Sutowo, it consequently led to financial problems for Habibie and his team, who had meticulously prepared for IPTN and were about to implement it. The absence of Sutowo as the firm financier had another consequence for Habibie as he had to face strong resistance from the Widjojo group, which controlled several economic ministerial positions and had a say in government budgeting. From the outset, the proposal to build an expensive aircraft industry seemed unreasonable to these pragmatic economists. As a result, the proposal drew strong objections from Widjojo and his colleagues, most notably J.B. Sumarlin and Ali Wardhana. Although the economists, as stated by Wardhana in an interview, acknowledged the importance of an aircraft industry for such a stretched archipelagic country like Indonesia, they concluded that the timing was not favorable. Considering limited resources of the

government due to the Pertamina crisis, the economists argued that it would be more rational for the government to focus the budget on sectors such as education, housing, and public works.[16]

Faced with these criticisms, Habibie and his team felt discontent. Habibie approached Suharto and asked him to make a decision on this matter while emphasizing that without the government budget his proposal would be useless. Setting aside all criticism from his economic experts, Suharto decided to favor Habibie's proposal, guaranteeing the financial commitment for the creation of an aircraft industry. Suharto's solution was simple: to take money from a non-budgetary, discretionary fund to which he was entitled to use as head of the state. With Suharto's full control over the government bureaucracy, it came as no surprise that state funds coming from this non-budgetary pouch were devoid of accountability and rarely scrutinized by the public. Through such funding, IPTN managed to grow at an exponential pace. Habibie did not question how Suharto provided the funds he needed to build and run IPTN. He thought that his main duty was only to use the money as planned to materialize what he was assigned to do.[17]

The new source of capital flowing directly from Suharto made Habibie more confident of successfully implementing what his group had planned. This started from finding a suitable location for aircraft production. Two possible sites were proposed at the time. One was the Kemayoran Airport area, and the other was in Pondok Cabe, about 50 kilometers south of Central Jakarta, close to the home base of Pelita Air Service owned by Pertamina; the latter was seen more acceptable. The industry was to be named *Industri Pesawat Terbang Indonesia* (IPTI). Despite a promising plan, Habibie and his team encountered a major stumbling block in their efforts to start the industry. Indonesia had just begun development and this meant that skilled human resources for a high-tech oriented industry were extremely scarce. It was a moment after the IPTI proposal that, according to Habibie, Air Force officials approached Suharto offering LIPNUR in Bandung as the best option for Habibie's plan.[18] As mentioned in his biography, Habibie was skeptical of Bandung as a strategic site for two reasons.[19] First, Bandung had limited space due to it being located in a valley. This would be a problem if the industry needed to expand its manufacturing plant. Second, the perpetual cloudy skies of Bandung posed a safety issue for test flights. Despite these issues, Habibie eventually agreed to take over LIPNUR in Bandung after Suharto approved the Air Force's proposal.[20] After all, LIPNUR had approximately 500 experienced engineers and technicians, as well as a spacious airport, available for use.

After considering a number of factors, the Habibie team set up an acquisition plan for LIPNUR. In August 1975, Habibie went to Bandung to meet personally with Yuwono, then director of LIPNUR. To Yuwono, Habibie explained his idea of turning LIPNUR into a modern aircraft industry equipped with high-tech manufacturing facilities. He also mentioned that Suharto was behind the plan and convinced Yuwono that money was not an issue.[21] After being convinced that the plan would be mutually beneficial, Habibie and the Air Force signed a

deal. The Air Force demanded that the new aircraft company be named after Nurtanio. Habibie seemed to have no objection. "What's in a name?" said Habibie. It was not his primary concern as to what to call the future company.[22] Shortly, the two parties set out terms of agreement. On 5 April 1976, Suharto launched Decree No. 12 to merge all available assets provided by Pertamina and LIPNUR as the embryo of the new aircraft industry. Three weeks later, a company named *Industri Pesawat Terbang Nurtanio* (IPTN) was legally registered before a notary public. On 23 August 1976, President Suharto officially inaugurated IPTN, marking a new era for the modern aviation industry in Indonesia. As a result of the agreement between Habibie and the Air Force, Habibie was named the president director of IPTN, holding full authority over the IPTN management, while the Air Force Chief Commander was placed as head commissioner. At the time, IPTN consisted of two small hangars (11,000 square meters) located on a 45,000 square meter site with 860 employees, mostly inherited from LIPNUR. Under fresh management, a new orientation for the aircraft industry took shape. Within the next ten years, the company grew rapidly following the groundwork set up by the Habibie team. Almost a decade after its inception, the name of IPTN was changed to *Industri Pesawat Terbang Nusantara*. The new name outraged the Air Force officials in Jakarta and ruined Habibie's relationship with the Air Force until they achieved a reconciliation a few years later.[23]

Figure 5.1 The IPTN site near Husein Sastranegara Airport, Bandung (source: IPTN documentation).

Four-step transformation

Each of the two narratives of Indonesian aviation history discussed above revolves around different central figures, socio-political contexts, and technical practices. We have also seen how the two intersected in two respects, namely, historical and ideological. As these two narratives mark the history of Indonesian aviation, it is important to examine what distinguishes the Habibie narrative from the Nurtanio one by juxtaposing concepts and contexts of technological development in these two periods. This examination will shed light on how the aviation development in the Habibie period was distinctive from the Nurtanio era as the former was part of a larger process of socio-technical transformation massively organized by the New Order's developmental authoritarianism.

What characterizes Nurtanio's technical practices is commonly called "reverse engineering," which is defined by M.G. Rekoff as "the process of developing a set of specifications for a complex hardware system by an orderly examination of specimens of that system."[24] Seen from an anthropological perspective, the platform that informed the way in which Nurtanio built his airplanes using existing resources and systems could be thought of as a process of *bricolage*, following David Hess (1995) who draws this concept from French anthropologist Claude Levi-Strauss in his analysis of how engineers engage in a process of constructing different versions of technology. According to Hess, engineers are *bricoleurs* in the sense that they take the versions of technology "from other communities and *reconstructing* them so that the elements are recombined to better fit with their own local culture, which includes the perception of what construction best matches their interests" (Hess 1995: 40). The process of bricolage in Nurtanio's pattern of technological development is clearly evident in the way Nurtanio reconstructed foreign-made airplanes inherited from the colonial military for a nationalistic cause. Starting from existing technical configuration of old airplanes, Nurtanio pursued new construction of systems and artifacts that fitted local social and environmental conditions. Such a process continued when LAPIP received technical assistance from the Czechoslovakian aircraft company to build locally adapted airplanes. As a bricoleur, Nurtanio's technical practices were organized around matters of technical configuration, material provision, and environmental resources. This means that the development of the aircraft industry that took place during Nurtanio's period was confined to micro contexts of technology, that is, within the materiality of technical artifacts. Despite some minor social and political factors shaping the airplane designs, Nurtanio's LAPIP had not yet evolved to such an extent that it linked directly with the national concerns of the aircraft industry involving more macro contexts, i.e., social, cultural, and political forces. This is the point where the integration of Habibie's technical expertise into a developmental context differed from Nurtanio's socio-technical experiences.

The scheme of technological development Habibie had planned is best encapsulated in his phrase *berawal dari akhir, berakhir di awal* ("starting from the end, ending at the start"). What he meant by this seemingly tautological slogan is basically a reversion of the process of industrialization, which in Habibie's

technocratic framework consists of four steps of gradual transformation.[25] The first step is the use of existing technology to produce products that meet domestic demands. This involves transfer of technology from foreign producers, which is initially pursued through license-based manufacturing. The chief goal of this stage is to familiarize local engineers and technicians with the complexity of technological processes. As they go through this step, they would acquire basic skills and experience in operating sophisticated technologies, which is otherwise unlikely to take place. The second step is characterized by activities to develop new product development using existing technology. This step requires creativity of local engineers in designing and constructing new products based on technical specifications adapted from foreign sources. Following this step is the development of technology, which encompasses establishing not only completely new products, but also upgraded technical systems. According to Habibie, this is the crucial point where local engineers indigenously develop an original technology, which, if successful, marks a great achievement in substantially reducing reliance on imported technology, hence establishing technological independence. The whole process culminates in the last step, namely developing capacity in basic research. In this step, the whole system of national innovation reaches an advanced state, characterized by robust production of new original technologies.

Habibie's four-step transformation implemented in IPTN seems to have similarities with Nurtanio's development plans set for LAPIP. Habibie started IPTN as a manufacturing company designed to build airplanes from the ones already in place. IPTN did not begin its activities with inventing new technology, but reconstructed existing technology. Transfer of technology was present not only in Habibie's scheme of technological development, but it was also carried out during Nurtanio's period. However, considering Habibie as a bricoleur is inadequate to comprehend the intersection of IPTN with the macro contexts of social, cultural, and political situations in the New Order era. Unlike Nurtanio, whose technical practice was mostly concentrated in the micro context of the Air Force, Habibie situated IPTN in a larger context of national development through which the implementation of four-step transformation was inextricably intertwined with three elements underpinning the foundation of IPTN: developmentalism, power relations, and a nationalist ideology. The intersection of these three elements distinguishes the role of Habibie from that of Nurtanio in building a modern, large-scale aircraft industry in Indonesia. Of course, it is possible to detect some of these elements in Nurtanio's LAPIP. Yet, the intersection was far less pervasive than in IPTN.

What is remarkable in the four-step transformation that functioned as the underlying logic of IPTN was its linkage to social change and modernization, a link that was not to be found with Nurtanio. Habibie sought to build this link by departing from a modern teleology informed by the New Order developmental ideology. Taking Western social history as the platform, this teleology assumes that every society is geared towards modernity in which the institutionalization of economic development and complex social systems become the primary

features. Societies in Western Europe and North America with economies that have reached sustained wealth are regarded as successful examples of how the teleology of modernity drives these societies to achieve sustainable well-being. What Habibie believed to be most crucial in Western social transformation was technology. Drawn from his life experience during the post-war German economic miracle (see Chapter 2), Habibie saw that socio-economic evolution is a process that could be deliberately accelerated. Being an engineer whose technical knowledge lies in manipulation of material systems to achieve a certain goal, Habibie sought to prescribe a shortcut trajectory that allowed Indonesia's developmental processes to accelerate by being driven by planned, high-tech based industrialization. Central to this mechanism was the four-step transformation of which IPTN was offered as a model that would stimulate the core activity of socio-economic transformation moving from traditional conditions to modern forms (visually interpreted in Figure 5.2).

Framed within such teleology, technology is set to serve a two-fold function: an engine of growth and an agent of change. While simultaneously generating economic progress, technology stimulates social and cultural production in society that revolves around modern processes. Yet, Habibie argued that the acceleration of socio-economic development catalyzed by technological forces differs from leapfrogging, a controlled process of socio-economic change designed to skip certain stages so as to achieve the goal in a shorter period. As Habibie remarked: "Accelerated evolution is entirely different from the concept of leapfrogging. Leapfrogging is random and unpredictable. Accelerated evolution is not random because its motion can be controlled and predicted. This means risks and costs of transformation can be reduced."[26]

Critical to scrutinize in this proposition is a striking proclivity towards technological determinism that unequivocally informs Habibie's scheme of

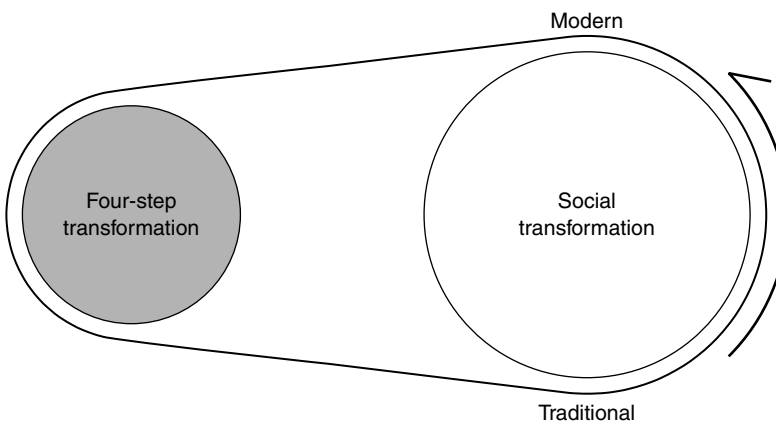

Figure 5.2 The link between the four-step transformation and social change and modernization as described in Habibie's high-tech formula.

accelerated transformation. The engineering epistemological assumptions are clearly prevalent in this developmental scenario in which social systems are portrayed as analogous to mechanical systems, the arrangement of which follows technical rationality to fulfill a quintessential purpose. In such a view, development is believed to be akin to an engineering process whereby manipulation and intervention are essential to produce desired outcomes. Viewing social processes from an engineering perspective, Habibie placed technological change at the core of a mechanism that was intended to drive the entire social system toward the reproduction of modernity. In this approach, technology is assumed to bring in modern values, e.g., rationality, objectivity, meritocracy, and efficiency, which a developing society like Indonesia could learn, thereby adapting itself to these modern conditions. In a nutshell, Habibie's developmental paradigm lies in the faith that it is the introduction of new technology that drives social change and developmental transformation. The irony of this paradigm is that while technological changes may ignite socio-economic transformations, the rate of technical evolutions outpaces the speed of social adaption due to the presence of social and cultural inertia that exist in such a process. This was evident in IPTN, when cultural and organizational predicaments sporadically appeared during the acceleration of itsdevelopment. The last section of this chapter will address this poignant issue.

Acquiring Western technology

Technology transfer is a common practice in every modernization project undertaken in developing societies. In fact, transferring technology from economically advanced countries has become imperative in any developmental plan. This path was also taken in the high-tech based industrialization that Habibie and his technocratic team formulated. As elaborated in the discussion of the four-step transformation above, technology transfer constitutes the first point from which the growth of national technological capacity is realized. In IPTN, this was implemented through the decision Habibie made to terminate the production of Nurtanio's Gelatik and instead to take on the production of foreign-designed airplanes under license. Like in any program of technology transfer, IPTN began to search for a Western partner willing to share technical knowledge, skills, and production systems. Since IPTN was planned to fulfill the domestic need of airplanes, the search was focused on Western companies whose products had been marketed in Indonesia.

As recounted in his biography, Habibie encountered problems when finding a foreign partner interested in sharing its technology with an Indonesian company. Habibie visited large aircraft producers but none of them were convinced that collaborating with the newly established IPTN would offer advantages. After taking some time to search for a potential partner, Habibie eventually succeeded in luring Construccionés Aeronauticas, S.A. (CASA) of Spain to engage in the development of the aircraft industry in Indonesia. CASA had already been in the business for over 50 years, specializing in light aircraft production. As was true

of IPTN, it started by producing aircraft under license before designing and manufacturing its own aircraft. CASA's most advanced design was the 15-seater C-212 Aviocar, which seemed to Habibie suitable for the local market conditions in Indonesia. In mid-1974, Habibie met CASA's CEO Enrique de Guzman, who was very impressed with the plan Habibie outlined. In September 1974, a triangular agreement was signed by Ibnu Sutowo representing Pertamina, MBB's Ludwig Bolkow, and CASA's Guzman in Munich, marking the commitment of these European companies to provide assistance for the development of the aircraft industry in Indonesia.

The process of technology transfer in IPTN started with the so-called familiarization phase, divided into two distinct stages. First, IPTN imported a number of CASA's C-212 and MBB's BO-105, already taken apart section by section, from Madrid and Hamburg. Hundreds of aircraft sections were reassembled in Bandung by IPTN technicians, enabling them to familiarize themselves with the complexity of the technical systems and the overall structure of the aircraft.[27] Once the IPTN technicians acquired knowledge of the aircraft structure, the second stage would be initiated. This time, C-212 and BO-105 were imported in separate parts. The challenge for IPTN technicians was to understand not only how to connect one part to another as if they were fixing a puzzle, but also how to reproduce those parts and to install them in a major structure. Gradually, IPTN technicians learned how to construct an aircraft down to the smallest part. This process required both technical and administrative skills, for every part had to be drawn and documented. In less than ten years, 97.5 percent of C-212 components were made in Bandung while BO-105 was completely locally made in IPTN facilities.[28] From 1976 to 1986, IPTN made rapid progress in both employee numbers and project completion. A number of joint venture commitments with Western corporations were signed (in Table 5.1). For example, IPTN and the French Aerospatiale agreed to produce PUMA SA 330, and with Bell Helicopter Textron to manufacture 100 Bell-412 helicopters.

Adding significantly to this growth was the success of IPTN in getting an order from General Dynamics to manufacture components of the F-16 in 1986.

Table 5.1 IPTN contractual partners

Licenses	*Joint venture*	*Technical agreements*	*Foreign offsets and subcontracts*	*Domestic subcontracts*
CASA (Spain) MBB (Germany) Aerospatiale (France) Bell Textron (US)	CASA	Boeing (US) General Electric (US) Grumman (US)	General Dynamics (US) Boeing (US) Fokker (Netherlands) British Aerospace (UK) Pratt and Whitney (US)	Merpati Nusantara Indonesian Air Force Garuda Airlines

Source: MacKendrick (1992) from IPTN staff.

This was the result of an agreement the Indonesian government made to purchase the F-16 from General Dynamics, which in turn gave IPTN an offset worth 35 percent of an F-16 squadron that Indonesia eventually agreed to buy. During its first ten years, IPTN established a weaponry system division called SISTA with the goal of producing certain types of rockets and torpedoes. In line with these developments, a great number of IPTN employees were sent abroad to study aircraft-related subjects at prestigious universities in Europe and North America. When they returned, they were expected to bring home new knowledge of advanced technology encompassing structure, material, avionics, control systems, industrial design, etc. At this point, it seems that what Habibie envisioned had become reality. The first stage of four-step transformation was achieved as IPTN had mastered knowledge of aircraft technology transferred from the West. Gradually, IPTN employees learned to work in an industrial culture characterized by systematic working patterns, efficiency, and high productivity. Equally important, IPTN had built a good reputation and became known within the international aircraft community. All of this laid the foundations for IPTN to become a modern aircraft industry.

Three years after IPTN started its operation, IPTN and CASA reached an agreement to initiate a joint program to develop a new propeller aircraft called CN235. This project was based on the US FAR Part 25 that covers medium range distance and has a capacity of around 35 seats. The initiative came from Habibie, who successfully convinced the CASA management that the program would benefit both companies. The CN235 development cost US$20 million, which was to be equally shared by IPTN and CASA through ownership of a Madrid-based company called the Aircraft Technologies Corporation (AIRTEC) with Habibie as the president director and CASA's president Carlos Marin Ridruejo as vice president director. Sutadi Suparlan, one of Habibie's dream team members, was named project leader from IPTN. Because the development process was mostly carried out in Madrid, IPTN sent its engineers back and forth to Spain to learn and work together with CASA's engineers.

The design of the CN235 was unique because it needed to fulfill two different purposes. Based on the airplane market in Indonesia, IPTN wanted a specific design suitable for military operations in remote areas. The goal was to substitute the very expensive C130 Hercules planes used by ABRI for troop transport throughout the country. CASA also needed a design with dimensions that would fit an F-16 engine. At the time, this Spanish company had planned to focus its business on the maintenance of American aircraft in Europe. For more than a year, engineers from the two companies and two nations engaged in the design process that was not without its supply of tensions and negotiations. The result of this collaboration was a wide body airplane equipped with a ramp door to facilitate all-purpose transport. Its basic configuration was 35 passenger seats, extendable to 44 seats. It was similar to other cargo aircraft, such as Hercules, Transall, Antonov, and Starlifter, but built with a smaller capacity (see Figure 5.3). Final assembly was to be carried out in both Spain and Indonesia. All construction sections were equally divided into two groups each of which was

produced by CASA and IPTN. While CASA was responsible for the center and forward fuselage, wing center section and inboard flaps, and engine nacelles, IPTN built outer wings and flaps, ailerons, the rear fuselage and the tail unit.

In 1983, the CN235 project was completed, resulting in four prototypes, two from each company. Two of them, CASA's Infanta Elena and IPTN's Tetuko, were used for flight tests, the other two for static testing. On 29 December 1983, the Tetuko made its maiden flight in Bandung over a month after its twin sister, Infanta Elena, took a flight test in Madrid. After completing over 500 flight hours, on 21 June 1986, CN235 was granted an airworthiness certificate by the Joint Certification Board of Indonesian and Spain formed by the civil aviation authorities of the two countries. Tension emerged between IPTN and CASA when the US Federal Aviation Administration (FAA) agreed to certify CN235 in December 1986. When the FAA tested the CN235 in Spain, the total hours of flight-testing were used on the CASA prototype, Infanta Elena. Considering that the Tetuko and Infanta Elena were identical in design, IPTN officials had mistakenly assumed that the certification of Infanta Elena would simultaneously be applicable to Tetuko as well. However, this was not the case. FAA only approved the CASA prototype. As a result, the CN235 prototype constructed in Bandung was not FAA-certified. This caused a serious problem particularly because there was no bilateral airworthiness agreement (BAA) between the civil aviation authorities in Indonesian and the United States, whereas the FAA certification is a key to the world market. Left with such disappointment, IPTN sought a certificate for CN235 from the British aviation authority whose certification procedure, unlike FAA's, did not require a bilateral agreement with the civil aviation authority in Indonesia.[29]

Despite the certification mishap, the New Order nevertheless regarded the successful completion of the CN235 project as an historic moment for IPTN in

Figure 5.3 The CN235 (source: IPTN documentation).

preparing itself for its breakthrough into the global aircraft manufacturing industry. Significant contributions by IPTN to the CN235 development evidently proved the capability of IPTN engineers and technicians to adopt and develop Western technology through sophisticated design and engineering processes. It was also seen as proof of the incredible competence of IPTN engineers to collaborate with their counterparts from technologically advanced countries, thereby showing the organizational capacity of IPTN as an industrial corporation to progress further. By merit of its various successes, IPTN had become the new symbol of national pride in Indonesia. To acknowledge what IPTN had remarkably achieved during its first decade, the New Order presented a lavish celebration for IPTN's tenth anniversary; the first Indonesian Air Show 1986 (IAS '86) was held at the old airport in Kemayoran, Jakarta. This colossal event was attended by 237 companies from aeronautics and related fields from around the world, most notably the United States, France, Britain, West Germany, the Netherlands, and Spain. Also participating in this event were the aerobatic display teams of Britain's Red Arrows and Jordan's Royal Jordanian Falcons. Suharto opened the air show with a pistol shot as a sign of pride as the leader of the organizing country.

The significance of the IAS '86 merits a discussion because it was no ordinary air show as far as the New Order regime was concerned. There were two strategic purposes at stake. One was to convince the public that the New Order policy of spending state budget to build a high-tech aircraft industry was worthwhile. The glamour of this event apparently served as a statement of the New Order regime that what IPTN had accomplished during its first decade signified the grand vision Suharto and Habibie had for Indonesia's development. Considering that IPTN had from the outset appeared controversial to the public due to the enormous financial resources allocated to its projects, the IAS '86 was meant to vindicate it, thus legitimating the path of high technology development. Apart from the domestic interest, the IAS was arranged as a venue to attract international attention to Indonesia, representing the country as a rising player in the world's aircraft business. Hence, the New Order meticulously configured the event to function as an exhibition to display Indonesia's ability to produce high technology products to meet international standards. This was imperative for a country recently embarking on development and now aiming to compete with airplane manufacturing giants. During the show, IPTN took the opportunity to take orders from domestic customers. With the state-run Merparti Airlines, IPTN signed a purchase contract for 15 CN235s, worth US$150 million. Represented by its chief commander General Moerdani, ABRI ordered six CN235s with a total value of US$120 million. The symbolic effects brought about by CN235 were equally as important as the project's commercial, economic and technical feats. As the person who had relentlessly favored everything about IPTN, Suharto rendered the appearance of CN235 at the IAS '86 as a national feat with an extraordinary meaning. For Suharto, it was a watershed in how the New Order technological state attempted to usher Indonesian society into an industrial era in the near future. In his autobiography, he made a remark about his great

self satisfaction of how IPTN was able to show the public that his regime had succeeded in harnessing the most strategic potentials, i.e., intellectual and techno-scientific resources. Suharto noted:

> For ten years since its birth, IPTN has widely contributed to our effort of mastering technology.… Our success in hi-tech development such as that of aircraft has raised our confidence that by taking any available opportunity our nation is capable for taking over and developing even the most advanced technology in the world.[30]

IPTN's accomplishment in the CN235 project was only the beginning of the advanced development the company was undergoing. Before CN235 entered the production phase, IPTN took on another new product development project called the N250. It was larger in scale and more expensive, and it signified the third phase in Habibie's four-step transformation. The following chapter will discuss in detail how the N250 project unfolded and what cultural significance this ambitious undertaking marked for the technological state.

Persuading opposition

Given its remarkable development within a relatively short period, IPTN had attracted wide public attention from domestic visitors and foreign observers who were interested in knowing and learning about how IPTN was able to grow its internal capacity in transferring high technology from developed countries. Habibie was fairly aggressive in inviting foreign visitors to IPTN as an effort to promote its products as well as to show to the outside world how Indonesia had succeeded in enhancing its technological competence at a rapid pace. Thus almost every month, IPTN welcomed visitors from various countries, both from government and private corporations, who came to take a look at the cutting-edge facility installed at IPTN. This of course was part of IPTN's marketing program. Yet, IPTN's display was meant not only as a shop window designed to increase the commercial attractiveness of this highly prestigious industry; one specific event tied the glorified presence of IPTN to a political desire of the New Order.

The much-highlighted success of IPTN in turning itself into one of the potential newcomers in the global aircraft industry had a greater significance to Suharto and his administration that transcended technological and commercial features. Equally important to note in understanding how the New Order technological state functioned through IPTN is the magnitude of the political weight this mega project brought to reinforce the basis of legitimacy of the regime. As I have discussed in Chapter 1, the longevity of the New Order authoritarianism principally laid in the role of military oppression and electoral legitimacy maintained for years by Golkar. These forces were added to by what IPTN had accomplished in acquiring and modifying sophisticated imported technologies. It had served to provide a non-violent source of legitimacy for the New Order

regime, one that was rooted in psycho-political effects produced by the magnificent appearance of high technology artifacts. Such effects were particularly relevant in the efforts to convince those who were extremely critical against the Suharto leadership.

One remarkable vignette that demonstrated the political efficacy of IPTN in persuading dissenting groups can be learned from what transpired between Habibie and a group of 50 prominent opposition figures popularly called by the media as the Petition 50. This opposition group was founded initially as a response to a speech Suharto delivered at the general meeting of the commanders of ABRI in March 1980. In his speech, Suharto instructed ABRI to proceed with its mission in preserving and protecting Pancasila and the 1945 Constitution. What instilled discomfort to the Petition 50 group was Suharto's implicit remark that some people remained doubtful of Pancasila and the 1945 Constitution. Although Suharto did not name specific persons in his speech, the suspicion was addressed to several respected seniors of ABRI who were no longer part of the regime, including former Army Chief of Staff A.H. Nasution and a former Navy officer who later became governor of Jakarta, Ali Sadikin. Troubled with Suharto's allegation, Ali Sadikin along with a few others, mostly retired ABRI officers, organized a petition to respond to what they perceived as unfair in Suharto's message. This resulted in a short statement of expressions of concern delivered to the Parliament in May 1980. The Petition comprised of three main critical points addressed to the Suharto leadership. First, the Petition claimed that Suharto had exclusively dominated the interpretation of Pancasila and arbitrarily associated Pancasila with himself. Second, Suharto had abused Pancasila to eliminate his political foes that had in fact previously supported the establishment of the New Order regime. Lastly, Suharto had mistakenly used Pancasila to justify deplorable actions by the authorities meant to suppress dissenting groups.[31] Signed by 50 individuals who came from different backgrounds and social groups, with military figures forming the majority, the criticisms raised by the Petition 50 against Suharto's leadership displeased the New Order leader, who, in a kneejerk reaction, banned all members of the Petition from going overseas. Suharto explicitly stated his displeasure on the Petition 50 in his biography: "I don't like what has been done by those who named themselves the Petition 50." Since then, the Petition emerged as an opposition group with significant influence over the mass media.

Over the course of next ten years, Ali Sadikin became the informal leader of the Petition 50, which evolved into a pressure group that openly questioned many of Suharto's policies of development. Garnering support from pro-democracy activists, the Petition regularly launched criticisms on various aspects of the New Order, from corruption and human rights violations, to the strong grip of Suharto's power upon the socio-political life of the citizenry. For a younger generation of anti-Suharto groups, the Petition 50 appeared to be a role model and it incited democratic movements organized by students and activists in the 1980s.[32] The fact that the Petition was initiated by military-related figures demonstrated that support for the New Order, even within the ABRI organization, was not unanimous. This

meant the Petition was regarded as the most significant opposition group capable of channeling the disillusion of the middle class groups about the undemocratic political environment the New Order authoritarian regime imposed upon the entire society. Leading figures of the Petition, most notably Ali Sadikin and Hoegeng, were often cited and asked for opinion by the mass media. For over ten years, the Petition served as the opponent of Suharto's developmental project and frequently called for a reconfiguration of power in the New Order political system. Consequently, during these years, tensions and frictions arose between the New Order leader and the Petition, which inadvertently drew public sympathy for the cause of Sadikin *et al*.

The clash between the New Order leader and the Petition surprisingly came to an end through a mediating role played by Habibie. Reconciliation was initiated when Habibie decided to invite a few prominent figures from the Petition 50 group to visit PAL in Surabaya and IPTN in Bandung. This dramatic change occurred in July 1993, 13 years after the Sadikin group publicly demonstrated its views against the New Order regime, and most of the members of the Petition were still unhappy with Suharto's leadership. The fact that rapprochement was worked out by Habibie raised some eyebrows. However, to some observers this came as no surprise. Habibie was then rising to power, especially having founded ICMI and turned this Muslim-associated organization into the most influential group in politics and policymaking. In retrospect, what Habibie did was considered a brave action in view of Suharto's dislike of the Petition 50. Habibie admitted that his plan to invite Sadikin and his fellows was genuinely motivated by his intention to share what the New Order had accomplished in the two high-tech based industries. He also informed the press that Suharto himself had approved the meeting. He convinced the public that the visit was nothing political as the media had suspected that the New Order regime sought to subdue the Petition. Despite what Habibie had mentioned about the meeting, it appeared that the visit of Sadikin and his group to PAL and later IPTN was more than just an ordinary event. This became clear when the Petition became surprisingly 'soft' to the New Order government. Reciprocally, the government revoked the ban on traveling overseas, which was imposed on the Petition 50 members, including its most respected figure, Nasution. Most of the discussion regarding this affair revolved around understanding the reason behind the reconciliation between the New Order and the Petition 50. Habibie's role was given a great deal of emphasis in illuminating how the New Order regime was trying to be more accommodating.

For the purpose of this chapter, I would like to interpret this affair from a viewpoint rarely, if ever at all, taken by any observer to establish a political relation between the dissenting group and the extensive production of high technology carried out in IPTN. The entry point is when Sadikin and his comrades of the Petition 50 encountered the massive technical artifacts that IPTN had produced and presented to them. They were awed and amazed by the presence of sophisticated technology built by Indonesian engineers in Bandung such that it affected their opinions about the New Order regime. Sadikin was even brought to tears

when he delivered a speech at IPTN in which he expressed his deep admiration and pride for what IPTN was able to achieve in high technology development. In an interview with *Tempo* after the visit to IPTN, he announced his support for Habibie's leadership in these military-related industries because Habibie, as he explained, had access to resources as well as intellectual capacity to develop such remarkably strategic technology for these industries. It is crucially important to note that after the visit, Sadikin seemed to change his critical stance towards the New Order. As he commented in the interview, "Frankly speaking, I don't see any problem with Suharto, Habibie, or anyone else. I see this as a problem of the whole nation and state, so I have to be honest."[33] The problem Sadikin was referring to is the advancement of technological capacity in IPTN and other strategic industries that in his opinion ought to be supported by the entire nation. It was in these terms that Sadikin would eventually agree with the efforts by the New Order to develop national competence and competitiveness in high technology as demonstrated in IPTN. Although this might not necessarily reflect the standpoint of all Petition 50 members, Sadikin was arguably the most influential figure of the Petition and his view plausibly represented the sentiments of the Petition toward the New Order. This suggests that the impressive psycho-political effect of high technology encouraged the Petition 50 to end their oppositional stance against the New Order as they came to acknowledge the importance and significance of the New Order's high technology accomplishments.

Unsatisfactory performances

As a corporation fully owned and funded by the state, IPTN experienced incredible progress from the beginning of its development. This is attributed less to market forces than to the firm favor of the New Order, which then triumphed to consolidate its power and managed to establish rapid growth in economic development. The sheer scale of expansion of this national industry is reflected, inter alia, in the number of its employees, which increased exponentially over time. When IPTN began in 1976, it employed 860 people mostly former technicians of LIPNUR. Two years later, IPTN had doubled its employees to 1,695 people. This figure tripled in the following three years. In 1983, IPTN had more than 10,000 workers. At its tenth anniversary, this number soared to 13,421, 15 times more than its initial employees. This rapid growth stabilized during the early 1990s when IPTN had over 15,000 employees (in Figure 5.4), which outnumbered Boeing employees.

Not surprisingly, such an enormous number made IPTN the largest employer in Indonesia, unmatched by any private and state-owned corporations. Yet, this eyebrow-raising employment level was unnecessary because, according to Paramajuda, one of Habibie's most trusted assistants at IPTN, only a third of this workforce was required for IPTN to run efficiently.[34] There were two reasons why this situation had arisen. Since IPTN's inception, Suharto wanted it to accomplish two strategic goals as pre-conditions for his constant support. First, in relation to its mission as an agent of development, IPTN was required to play

a central role in technological advancement. This role situated the corporation as a center for excellence in which engineers and technicians from around the country came to acquire and develop technical knowledge and skills. They were prepared not only for IPTN projects, but also for other industrial-related sectors that demanded advanced skills and knowledge in operating and developing modern technologies. As a result, one of the largest divisions within the IPTN organization was its training center. As often described in a metaphor by the New Order regime, IPTN functioned as a citadel where "technological patriots" were trained to anticipate the battles in the global industry. The second reason for the oversized workforce at IPTN was rooted in the New Order's interest to increase employment. The New Order government deliberated that as a capital-intensive industry, it would be reasonable for IPTN to provide significant numbers of jobs to Indonesians. In fact, this was part of the deal between Suharto and Habibie to ensure that the astronomical investment in IPTN had a positive impact on employment. People would see that the utilization of high technology at IPTN did not necessarily reduce the use of skilled workers. This was the point that Suharto proudly emphasized:

> Despite using high technology, our aircraft industry apparently requires a great number of workers. You can't find a textile industry, for example,

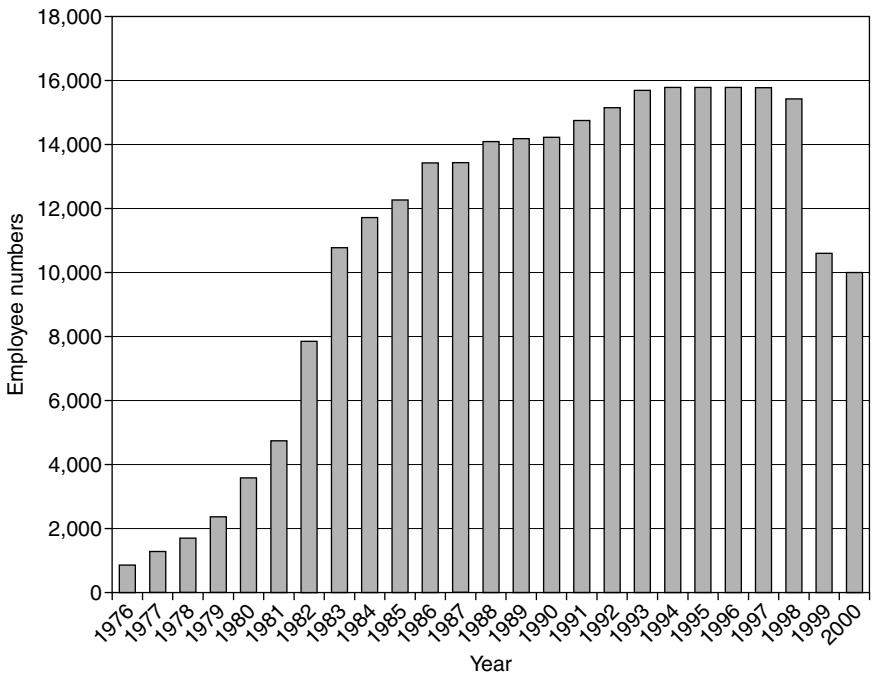

Figure 5.4 IPTN employee numbers (1976–2000) (source: IPTN staff).

> employing plenty of workers. Usually they have only two or three thousand employees. Even Krakatau Steel which spent hundreds of million dollars only absorbs 3,000 workers, whereas IPTN which took no more than a billion dollars has employed 13,000 skilled workers.[35]

Suharto might have been proud of the role IPTN played in creating numerous employment opportunities for technicians and engineers, and in contributing to the circulation of technical knowledge and skills. Yet, this came at the expense of the industry's productivity and efficiency. An immediate consequence of such an overweight size was the considerable financial burden that IPTN had to bear in paying its workers every month. Because of its large number of employees, IPTN seemed to have no choice other than to set remunerations for the majority of its engineers and technicians substantially lower than what private corporations would offer on average. It came as no surprise that most of the IPTN engineers sought various moonlighting channels to increase their overall earnings, resulting in decreased productivity of IPTN in general. Another consequence was its impact on the use of manpower. Assignments and duties were often carried out with more manpower than necessary. It was not uncommon to find work normally handled by one person involving five or six people during IPTN's growing period. As such, inefficiency loomed large in almost the entire organization of IPTN, from administration, management, and manufacturing, to R&D.[36] The number of employees was not the only number that grew rapidly in IPTN. Its cumulative assets had remarkably increased during the first decade and underwent only minor fluctuations during the second (shown in Figure 5.5). By 1986, its total asset value was over IDR1 trillion. This amount soared three times by 1992 before turning down slightly and moving up again in 1997 with a total asset of IDR3.6 trillion.

Looking at this figure, IPTN was no doubt one of largest companies in Southeast Asia. In Indonesia, only a handful of companies had nearly as much total investment value as that of IPTN. As a state-owned company, all investment came from the state non-budgetary funds completely at the discretion of the president. Yet, IPTN's financial statements were never disclosed to the public. This violated principles of public accountability supposedly adopted by IPTN's projects. The absence of public accountability distanced IPTN from public scrutiny. But that was not the only crucial condition to its operation. Lurking behind Habibie's claims in overstating the bright prospects of IPTN projects was poor business performance. In contrast to its gigantic cumulative assets, the sales rate of this aircraft company was not as promising as the New Order government revealed to the public.

As displayed in Figure 5.6, from 1976 to 1992 annual sales grew very slowly. They leaped in 1993, and declined the following year. In 1995, the sales rate started to experience significant growth up to the highest point in 1998. This impressive sales rate was accompanied by poor performance in profitability. In this sense, IPTN barely gained any revenue following its initial operations in 1976. Only a few years experienced even small profits; the rest were marked by

negative balance sheets. Despite a substantial increase in sales in 1998, it was during this period that IPTN's revenues reached an unprecedented low point; its loss totaled IDR798 billion, for which the freefall of the rupiah's exchange value due to the Asian monetary crisis was responsible. Looking at these disappointing outputs from a cost–benefit analysis may lead to the conclusion that IPTN produced more disadvantages than benefits for the government's substantial expenditure in this high-tech industry.

The absence of public accountability helped IPTN to conceal its gigantic losses from public scrutiny; hence, IPTN was able to temporarily maintain its prestigious image. Yet, in the second half of the 1990s the reputation of Habibie's brainchild plunged after two incidents. One occurred when the mass media reported a counter trade between IPTN and the Thailand government in 1996. At that point, Thailand had agreed to purchase two units of IPTN's CN235 in exchange for 110,000 tons of Thai sticky rice. Counter trade is common in international trading transactions. But the fact that IPTN's high technology products were exchanged for a low-tech agricultural commodity seemed ironic and thus damaging to IPTN's image. This instantly evoked negative responses and IPTN became an object of mockery, especially by those who disagreed with Habibie's high-tech-minded policy. A year later, on 22 May 1997, a tragedy struck IPTN when a military version of the CN235 crashed during a test flight in Serang,

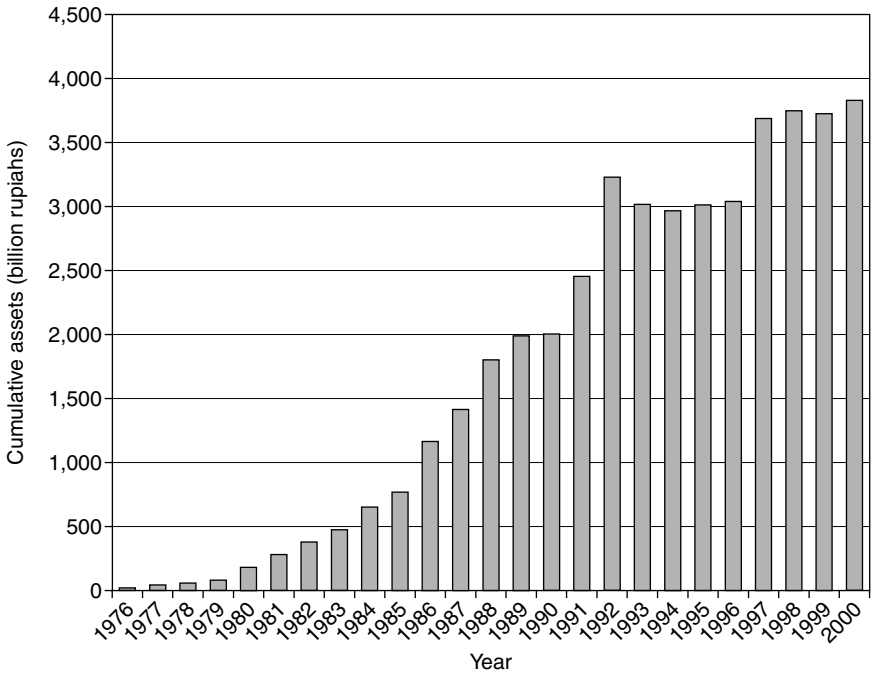

Figure 5.5 IPTN's cumulative assets (1976–2000) (source: IPTN staff).

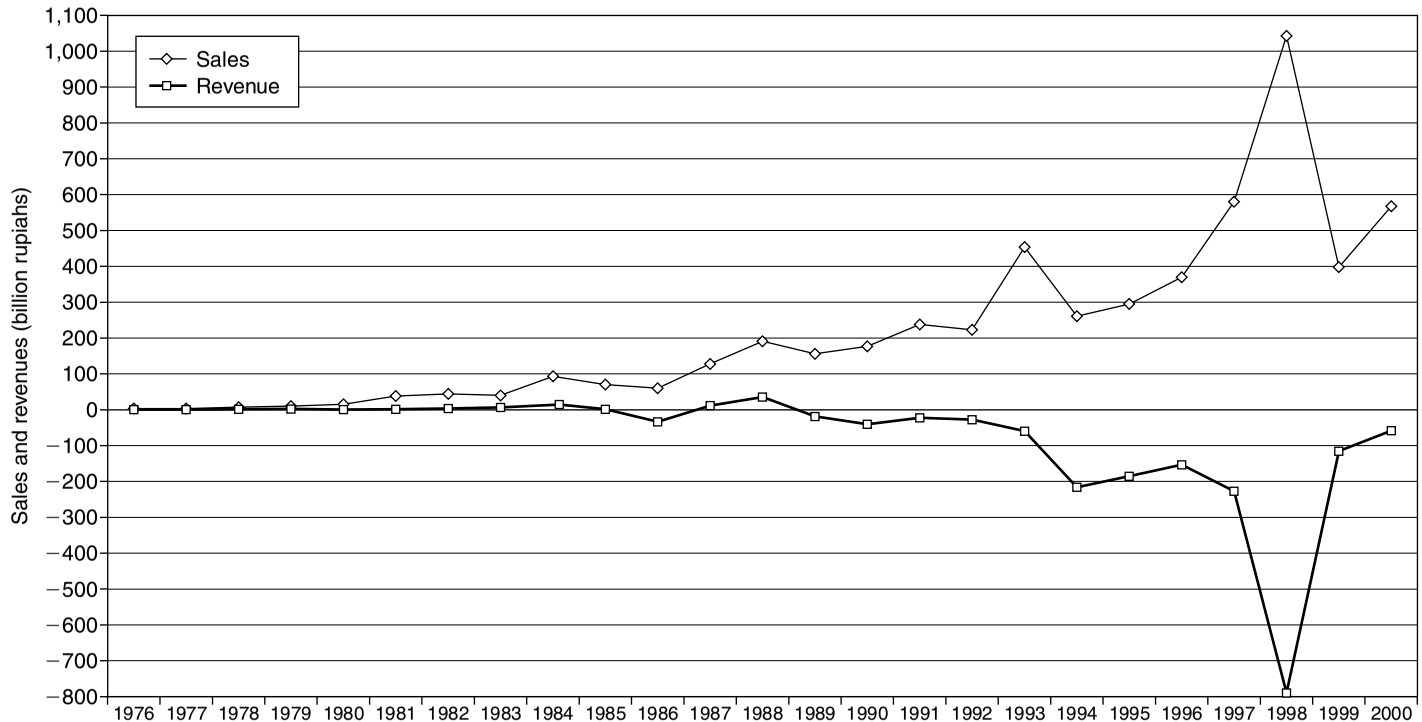

Figure 5.6 IPTN sales and revenues/loss (1976–2000) (source: IPTN staff).

West Java. Six people were killed in the accident, including IPTN's most experienced test pilot, Captain Erwin Danoewinata. Habibie explained that the plane stalled when the parachute strand used to pull a four-ton load from the ramp door malfunctioned, leaving the load at the rear of the airplane. This caused the plane to lose its balance and send it crashing towards earth. By implication, Habibie attempted to show that the cause of the accident did not originate from the construction of the airplane. However, this accident had already led the public to question the safety and reliability of IPTN products.

These two unfortunate incidents inevitably affected the public image of IPTN. Although many were still convinced of the bright future of this state-owned industry, there was increasing skepticism about IPTN. Following these setbacks, there emerged many questions as to how this highly prestigious industry involved in transferring Western technology had fallen so deeply into trouble. Responding to the issue of low profitability in IPTN, Rahardi Ramelan provided an insider's explanation. According to Ramelan, one of the most disturbing problems in selling IPTN products was the lack of financial assistance for the buyers, a common scheme provided by aircraft producers. As a result, many purchase commitments did not materialize. He blamed the Finance Minister for not giving full support for the provision of export credits, which gave IPTN difficulties in enticing buyers.[37] As noted in Chapter 3, competition and disagreements between the engineers and the economists affected bureaucratic politics. Although the Habibie group outnumbered the economists in the Suharto cabinet, the allocation of the state budget remained in the hands of the economists, through the position of the Finance Minister. The clash between the engineers and the economists seemed to hinder IPTN projects because all of the financial schemes necessary to facilitate the sale of IPTN products needed the approval of the Finance Minister.

For a few analysts, IPTN's financial losses were just the tip of the iceberg. Beneath the surface was a gigantic problem in management that had haunted the IPTN organization for many years at all levels. According to David McKendrick (1992), who conducted a study on the corporate management at IPTN, it was not possible for the IPTN to be commercially viable and stay internationally competitive unless it improved its managerial capabilities. The source of the problem, McKendrick argued, lies in its speedy expansion of product lines. As discussed above, IPTN produced several license-based fixed wing and rotary wing airplanes in addition to a joint development program with CASA. In a similar vein, Sören Eriksson (2003) argues that the long-term failure of IPTN comes from its overemphasis on technology with less attention to the aspects of business, management, and marketing. The issues of managerial capabilities arose as these projects overlapped, placing high demands on skilled workers and, simultaneously, enormous pressures on managerial skills which were required to handle a variety of tasks such as procurement, inventories, documentation, etc.

The IPTN management was aware of this situation. In 1982, IPTN hired Boeing Corporation to develop a management system specifically customized for the conditions in IPTN. Through a US$8.9 million contract, Boeing assisted

IPTN in building its own managerial system that was supposedly adequate in integrating all the separate systems involved in the company's license-based programs. Unfortunately, this program did not run as smoothly as the management had hoped. Not only was IPTN compelled to catch up with Boeing's competences built over decades of experience, it also had to translate three different systems and languages from CASA, Aerospatiale, and MBB into IPTN's own system based upon Boeing's manuals. These cumbersome procedures led IPTN employees to make frequent mistakes in translating the licenser's system to the IPTN manual. This was exacerbated by IPTN's bloated administrative structure and caused lengthy bureaucratic wrangles. As a result, most CN235 deliveries were years behind schedule. This predicament discouraged potential buyers and burdened the whole financial structure of IPTN.

Exacerbating the low managerial capabilities was the presence of a highly centralized bureaucratic structure. This was noted in a study by Chicago-based A.T. Kearney, who Habibie hired to audit IPTN in 1996. In analyzing one of the factors that constrained the effectiveness of IPTN's high-level organization, Kearney pointed to the wide span of control exercised by Habibie as the president director. He observed 40 individuals under the direct control of Habibie, a number that much exceeded the span of control in an effective organization.[38] Kearney highlighted that this structure was not healthy for a commercial corporation like IPTN because the decisions will typically go up and down and rarely across, except at the top. A former director of IPTN lamented the way Habibie controlled the management of IPTN with a top-down leadership style. This was reflected in the fact that almost every decision required direct approval from Habibie himself. This centralization of decision-making failed to create a environment conducive to horizontal communication between high-tiered officials because they always waited for Habibie's direction. Consequently, most IPTN management officials lacked any sense of responsibility, creativity, and self initiative.[39]

It is inadequate to identify the root cause of the organizational problems that plagued IPTN solely within the micro-level analysis of corporate management. There was a strong link between IPTN's internal, structural problems and the macro-level influences, in particular the play of power and politics. If one examines Habibie's leadership during his tenure at IPTN, it is possible to trace the seeds of the centralized decision-making from the structure of power through which Habibie obtained political supremacy. The authoritarian character of the New Order was mirrored within the organizational structure and chain of command in IPTN as the company increasingly resembled the regime itself. In other words, the way IPTN was managed reflected the power relations of the New Order. In the end, IPTN's maladies were possibly caused by a bureaucratic formulation that overlooked the social and cultural configurations involved in technology transfer. The evidence of IPTN's inability to rapidly turn itself into an efficient aircraft manufacturer leads to fundamental questions about the adequacy of Habibie's accelerated transformation. The plethora of problems faced by IPTN in translating the systems of technology into its own, and in

acquiring foreign technologies and organizational methods in an efficient manner, indicates that developing high technology is more complex than Habibie and his group initially believed. Indeed, the proven ability of IPTN in constructing new airplanes must be acknowledged. However, technology is not solely about the competence to build gigantic and powerful machines. It is also about how to create social and cultural environments that adapt human efforts towards machine rationality. It was within this realm that IPTN met enormous cultural barriers. This confirms a fault in Habibie's formulation to realize that technological progress is achieved through complex processes of social and cultural production, which together constitute socio-technical transformations. In sum, as several STS scholars have elaborated,[40] technology is not an autonomous driving force of change but part of a larger process in which social, cultural, and political arrangements matter a great deal in defining development and advancement in any society.

6 Take-off

It is evident that the take-off requires the existence and successful activity of some group in the society which is prepared to accept innovations.

W.W. Rostow

A state with a political economy structured around the co-constitution of high technology and authoritarianism constantly feels necessary to exhibit its accomplishments in making socio-technical progress. Such an impulse marks the presence of the technological state, which is typically manifested in colossal projects. The common result is a superior technological artifact, a hallmark that functions to showcase the prowess of the state symbolically and materially. In this chapter, the realization of the high technology vision into a technical object becomes a focal point in our analysis of the New Order technological state. As discussed in the preceding chapter, the Indonesian aircraft industry was the main locus of the state's pursuit of technological supremacy. This chapter now turns attention to another layer of the technological state to examine one particular artifact that reflected the remarkable amalgamation of institutional, financial, and techno-scientific resources the New Order tenaciously allocated to achieve its grand goal. This chapter will examine the N250, which the New Order leaders displayed as a new source of national pride and a symbol of the New Order power. The N250 was a turboprop airplane designed to suit 50 passengers. Claimed to be entirely designed and crafted by Indonesian engineers, the N250 airplane marks what Habibie called the era of technological independence, a term that refers to the quality and capability of Indonesian engineers not only in mastering sophisticated technologies, but also in developing new ones without foreign partnership. What is striking about the N250 project is that its construction integrates elements of technical rationality, narrative of nationalism, and symbolic representation of the state. Anthropology of the state as Clifford Geertz (1980) conceptualized becomes relevant in this light to reveal the underlying logic that connects material and symbolic realms of the state as demonstrated in the creation of the N250. Following Geertz, this chapter seeks to unveil the way in which technology sets the stage for the state to display its power. Through the presence of a magnificent technological object, high technology appears to

embody the state power. David Nye (1996) suggested that a magnificent man-made object possesses the potential to arouse religious feelings in those who encounter it. By the same token, the persuasive effect of high technology as exemplified in IPTN's N250 gave the state a historic opportunity to integrate Indonesian society in a unifying sentiment and spirit of nationalism that reinforced the legitimacy of the New Order state. This attempt requires delving into the engineering processes of N250, through which the IPTN engineers were emotionally engaged in the construction of the artifact. This point will be further elaborated in this chapter.

Technological independence

After one decade of operation, IPTN had successfully convinced the New Order regime of its growing ability to acquire knowledge and skills for high technology production from its foreign counterparts. As the president director of IPTN, Habibie wanted the aircraft industry to move one step further in expanding its capacity for innovation and manufacturing. This required developing a new product substantially more advanced than what IPTN and CASA had jointly conceived. In 1985, MBB showed an interest in collaboration with IPTN. It offered Habibie a joint project called Multi-Purposes Commuter MPC75, which was supposed to be a tripartite endeavor with the Chinese government.[1] Due to the absence of diplomatic relationships between Indonesia and China during that period, IPTN had to withdraw from the venture. MBB then offered IPTN another program to develop a jet airplane, NTT285. It lasted for a short while before Habibie decided to terminate it. A longer lasting collaboration was formed later when IPTN agreed terms with MBB, along with two other giants of the aircraft industry, Boeing and Fokker, to build ATRA-90, an acronym for Advanced Technology of Regional Aircraft. These four companies signed the memorandum of understanding on 12 January 1986 to produce a 100–130 seat aircraft utilizing the latest propeller technology.[2] The initiative came from Habibie who wanted to bring IPTN into the third phase of its accelerated transformation.[3] This phase followed the success of the earlier CN235 project. While the CN235 project had enabled IPTN to acquire technical knowledge and skills of aircraft construction and design from CASA, this time Habibie sought a project that would enhance IPTN capabilities in designing a more advanced product. Habibie believed that IPTN's collaboration with the other large companies in this joint project would help IPTN take giant leaps in aircraft engineering. The collaboration was also important in enhancing IPTN's image. As Habibie stressed, working together with these global aircraft producers with decades of experiences and superior capabilities would reflect the credibility and recognition of IPTN on the international stage. This image was successfully presented in the international media. A year into its development, it turned out that ATRA-90 was not as promising as IPTN engineers had thought. One executive of the consortium revealed that uncertainties of the market and technological factors led the project to be too costly.[4] As a result, the project ended with a preliminary design and was never resumed.

Before ATRA-90 was completely terminated, Habibie started another project in 1987 and was determined that this new project will be an independent one by IPTN. This decision raised eyebrows among aircraft producers, for it was considered too risky given the fact that IPTN was relatively a newcomer to the business. Habibie's determination to embark on a new project without foreign partners was driven by three primary reasons. First, there was a demand that IPTN should create its own unique product. This was to counter the allegation from many of Habibie's critics that IPTN was not able to produce its own products.[5] Another reason came from what IPTN had learned from the CN235 project. While the project was successful in increasing the profile of IPTN in the aviation industry, IPTN's top engineers felt they were unfairly dominated by CASA and was not able to reap the full benefits from the completion of CN235. Despite the equal market share IPTN and CASA had agreed upon, IPTN's sales of CN235s were only one-third of CASA's. Former IPTN director Paramajuda blamed the poor sales performance on the image of IPTN as an aircraft producer from a developing country, which may have weakened IPTN's sale of CN235 in international markets. As Paramajuda bluntly bemoaned, "the skin color really matters and CASA had gained considerable advantage due to racial biases."[6] He believed that white supremacy had apparently influenced most buyers, including those within IPTN's market domains, and thus they preferred to purchase CN235s from CASA rather than IPTN. In addition, the CN235 was equipped with technical features that served military needs more than commercial purposes, making it difficult for IPTN to sell CN235 on the domestic market. Since CN235 was designed for cargo transport, its bulky configuration caused heavy air friction, thus reducing its speed. Its structure also produced a high noise level intolerable for passenger transport. These drawbacks discouraged many local commercial airliners from including the CN235 in their fleet. Realizing that IPTN would have to develop fully commercial airplanes in order to achieve expected profit levels, Habibie planned to create a completely new aircraft instead of modifying the CN235 platform. He believed that such a project was favorable given the technology transfer and years of experiences IPTN had cultivated from collaborations with the big players in the aviation industry. Despite the economic challenges facing Indonesia at that time, Suharto gave his full support for the new aircraft development initiative as he was convinced his favorite aircraft industry should now advance to high levels. Suharto's commitment was manifest in the enormous state funding and support provided for the project. The decision to commence the development of a new product, which relied completely on IPTN's own expertise, had inevitable consequences. The company had to deal with the risk of failure on its own, rather than with partners, as previously. Despite a slim chance of success, many of the IPTN engineers, especially the second generation engineers, viewed the project as an exciting challenge worth taking up for the opportunities of growth it offered to their personal careers and the company's future. This cohort of professional engineers joined IPTN in the early 1980s and had enjoyed the excellent engineering facilities and training programs provided by IPTN. A large majority of this generation

obtained graduate degrees from abroad with scholarships either from IPTN or BPPT (see Chapter 3) and formed the core team for this new independent project.

Soon after the ATRA-90 project was fully shut down, IPTN formed a team of 30 engineers with Habibie in the lead. The first main task the team was assigned was to formulate the concept of a new aircraft. It began with a market study in 1987 from which the team identified a growing market in regional flight for airplanes with a range of 800 miles. Under Habibie's direction, IPTN seized this opportunity as the entry point. Apart from the global market, the IPTN team also noticed that the majority of Fokker 27 airplanes used by Indonesia airliners were about to be phased out. It was estimated that IPTN could provide 400 units for the domestic market alone. Poised to grab this market niche, the IPTN team aimed to develop a 30-seater aircraft: the N230. It was later renamed the N250[7] after a further study found market demand for 50-seater airplanes.[8] In the 1989 Paris Air Show, Habibie openly announced the N250 project to the public for the first time.

Because it was intended to serve short-haul flights, the N250 was designed as a propeller aircraft from the outset. The N250 lead engineer, Alex Supelli, explained how propellers were in many ways more economically efficient for a commuter aircraft than jet propulsion. The team, however, was deeply aware that the speed of a propeller aircraft was very limited while regional flights demanded fast transportation. Habibie suggested the N250 team proceed with turboprop technology. This was a feasible solution because this type of propeller could increase the cruising speed up to 330 knots, making N250 the fastest propeller airplane in the subsonic class.[9] With the specifications in hand, IPTN's N250 team started designing what they imagined to be a breakthrough in aircraft construction. Alex Supelli, who completed his training in aeronautic engineering at ITB, delineated this process as a "complex endeavor, involving multidisciplinary expertise from structural engineering, avionics, material science, flight-test engineering, among other fields." During the design process, the engineers went through numerous iterations working back and forth between drawing boards and wind tunnel laboratories at PUSPIPTEK where they tested their designs. The chief goal of this iterative process was to find a perfect configuration that not only met the market needs but also represented what the team defined as "the technological prestige" of IPTN. Supelli recalled a few critical problems they encountered in finding a suitable structure.[10] At the start, the team dealt with two options for wing position. The condition of poorly paved runways in many of the Indonesian airports was a primary concern. To respond to this common condition, the N250 engineers decided to place the wing at a high position relative to the fuselage to create wide clearance from the ground. This design consequently entailed placing landing gear in the fuselage instead of attaching it to the wing as is usually the case on propeller airplanes. Because it was meant to travel at a higher speed, the N250 was designed to fly over 25,000 feet, which necessitated a pressurized cabin, following the FAR Part 25. The engineers faced a more challenging problem when they started to design the tail. The initial proposal

was a low-tail design, a common configuration in many airplanes, including the CN235. But the engineers encountered difficulties when the design was tested in the wind tunnel. Because the N250 needed a hefty engine to reach 330 knots, the engine produced so much thrust that it disturbed the tail. This shook the longitudinal stability, especially when the airplane was in approaching position. To overcome the problem, there was a suggestion to design a cross tail, placing the empennage in the middle of the tail. For some reason Habibie did not support this idea. The only option left was a T-tail configuration. This was not an easy decision because such a structure was vulnerable at a high speed. Fortunately, IPTN engineers managed to resolve this problem.[11]

Finally, the most critical element was the engine, which constituted 10 to 15 percent of the airplane price. The team had three options of engine for the N250. One of these was General Electric (GE). Since GE required at least three industrial customers to develop a new engine, it offered IPTN one of its existing products, which was modified to yield more power. IPTN rejected this offer because it did not suit the designated requirements. The second option came from Pratt and Whitney (PW) of Canada, also offering an enhancement for an existing engine. It was good enough for the N250 but the capacity of the engine was not sufficient for the N250's extended version. IPTN turned down this offer. The team finally went with AE 2100C from Allison. Like GE and PW, Allison came up with a previous product, one from 1964 used in Hercules. The engine had been enhanced to yield 5,000 horsepower (hp). This actually exceeded the need of the N250, which only required 3,000 hp. Allison's engine was given the nod also because of its fuel flow and cost–power ratio. Furthermore, their overall package included a good deal on maintenance services. Attached to the Allison engines was a pair of five-blade R384 propellers produced by Dowty Aerospace especially for the N250. The R384 was a state-of-the-art propeller, the design and material of which greatly reduced noise levels. This set of latest technology rendered the N250 cabin as comfortable as that of wide body aircraft such as the Boeing 747 or Airbus 300. During the construction of the N250 first prototype, the IPTN engineers learned that the N250's structure could be stretched by 1.5 meters to accommodate 70 passengers without major changes in the structure and engine capacity. This became a distinct advantage for the aircraft. Habibie named the enlarged aircraft N250–100, which was a blueprint for the second prototype.

As the N250 project progressed, human resources devoted to the project soared exponentially. Starting from a team of 30 people, the entire process of design phase involved 1,500 engineers coming from different expertise backgrounds and with a range of experience in manufacturing processes. The magnitude of the project even led IPTN to form a separate division for the N250 program. When the detail design phase was completed, tens of thousands of drawings had to be made. To handle such cumbersome jobs, IPTN installed a new computing system from France called CATIA and sent abroad dozens of its employees for training in operating the system. Due to a lack of drafters and engineers, IPTN hired about 200 foreign engineers and drafters to support local

staff in completing the task. To improve the quality of its human resources for the project, IPTN sent about 250 employees abroad to study for PhDs in aircraft-related fields. Apart from the huge volume of manpower involved during the project, IPTN also built a couple of new research facilities previously lacking. These included a wind tunnel, flight test simulator, iron bird laboratories, and so forth, which made up to one-third of the entire cost of the N250 program. As mentioned in Chapter 4, some of these facilities were installed in PUSPIPTEK. To avoid the certification mishap that occurred in the CN235 program, this time IPTN ensured necessary measures were carried out early. Using his bureaucratic power, Habibie made a special approach to the Directorate General of Air Transportation. He placed one of his staff in the Directorate General of Air Communications (DGAC) to arrange a BAA with the FAA. An airworthiness certificate from the FAA was extremely important for the N250 to gain acceptance into international markets.

Compared to the CN235, the N250 was obviously a much larger and costlier program. The vast amount of funding the New Order regime spent on the entire project indicated the program's scale. The initial proposal estimated a budget of US$600 million, a figure Habibie presented to the public.[12] As the aircraft gradually came into realization, new requirements were incorporated, including tools, software, raw materials, and technical skills. Consequently, the project expenditure increased. According to Joko Sartono, project officer for the N250, the augmenting cost for the N250 programs compelled IPTN to revise its budget plan to US$1.2 billion. Such an enormous development cost, Sartono argued, was still acceptable because it included certification processes, training programs, and manufacturing facilities development.[13] Similarly, former Director of IPTN Jusman S. Djamaluddin defended the revision when he noted that developing a new product often incurred such extensive costs. According to him, the benefits from the increased technological capacity would justify the high expenditure on building the facilities at IPTN. Indonesian society should consider it as a form of investment that would allow Indonesia to compete with developed nations. In Djamaluddin's own words: "the expensive facilities should be regarded as a long-term investment for scientific infrastructure not only for IPTN but also for Indonesia as a whole."[14] This justification, however, was at odds with comments by Hari Laksono. Former Commercial Director of IPTN Laksono admitted that the astronomical amount of money allocated for the N250 program was partly caused by rampant inefficiency in many layers of IPTN management. It comes as no surprise that weak organizational arrangements in IPTN programs resulted in the ballooning of the costs for the N250 project.[15] Despite these issues, there were no substantial difficulties in securing financial support and funding for the N250 program.

One may wonder how the N250 was financed. As discussed earlier, it was not difficult for IPTN to seek funding for its programs. As a state-owned company, the N250 project was entirely underwritten by the government. Habibie's direct access to Suharto made it even easier. However, this does not mean that all the financial backups that IPTN needed to complete the N250 project were to be

available at anytime. While Suharto was committed to the success of IPTN programs, the finance minister was not always able to accede to IPTN's request on time. Former Finance Minister Ali Wardhana explained that, given limited financial resources, his department had to compromise many funding proposals from other sectors. "IPTN was not the only program I was obliged to serve," he defended.[16] As discussed in Chapter 4, high technology development was not at the top of the list for the New Order economists who controlled the state financial management. Hence, the finance minister did not deem funding for IPTN projects as a very urgent matter. As a result, the financial allocations flowed to IPTN in little by little. This caused considerable delays in procurement, which affected the schedule of the N250 program. As the N250 first prototype neared completion, IPTN desperately needed cash to finish its construction to meet a targeted dateline. Habibie had planned a public demonstration of the N250 to celebrate Indonesia's 50th anniversary in August 1995. To do so, the N250 construction had to be finished before the anniversary. Knowing that the finance minister was not responsive, Habibie went straight to Suharto, requesting quick cash for the project. As the head of the state, Suharto held discretionary funds drawn from varieties of sources categorized as off-budget.[17] He could use these funds for any purpose at his disposal. One of these off-budget sources was the Reforestation Fund, which was under the account of the forestry minister. The Reforestation Fund was started in 1990 through Presidential Decree No. 29. Contributions were sought from every forest concessionaire. The purpose of this fund was to support the preservation efforts of Indonesian forests. In 1992, the fund amounted to IDR2.4 trillion deposited in the form of Bank Indonesia certificates. In that year, the interest alone from this deposit was IDR825.88 billion. Drawing from this fiscal pouch, on 2 June 1994 Suharto signed Presidential Decree No. 42, which granted an IDR400 billion interest-free loan to IPTN to support the production of the N250 first prototype. In return, IPTN would have to give a 5 percent royalty from the sales of N250s to the forestry minister.

One month after the presidential decree, news of using the Reforestation Fund for the N250 program leaked to the public and drew widespread criticism. In response, six environmental NGOs (Walhi, Lembaga Alam Tropika Indonesia, Yayasan Forum Studi Kependudukan dan Lingkungan Hidup, Lembaga Pengembangan Lingkungan dan Sumber Daya Manusia, Lembaga Pengembangan Hukum Lingkungan Indonesia, and Yayasan Pelangi Indonesia) joined together to file a case against President Suharto at the State Administrative Court (PTUN) in Jakarta. Represented by Indonesian Legal Aid Foundation (YLBHI), these NGOs demanded Suharto annul the decree. They presented two arguments as to why the decree was against public interest. First, the deforestation rate in Indonesia was much faster than reforestation efforts. From 1982 to 1993, 2.4 million acres of the forest had been destroyed, while approximately only one-quarter of critical lands were being rehabilitated. Second, although the government had given serious attention to this issue, lack of funding was apparently one of the main problems. Indonesia even had to resort to foreign aid for reforestation programs in the 1992/93 Financial Year. This meant that Suharto's decision to

divert the reforestations fund to IPTN had weakened the government's financial capabilities to preserve Indonesian forests, thereby harming the environmental interests of the public.[18] Since the 1970s, economic development under the New Order increasingly threatened the Indonesian forest's long-term sustainability. The NGOs' protests were not unfounded and one would have expected the government to accept their reasonable demands based on substantiated arguments. However, political considerations mattered more than environmental concerns. At the time when the NGOs tried to sue Suharto, the New Order regime was maturing and Suharto had effectively consolidated his power. No opposition party, or the military, bureaucrats, politicians or activists, was able to assail Suharto's position. Under such political conditions, it was no surprise that the NGOs' challenge to Suharto had no effect. On 8 January 1995, PTUN dismissed the charge on grounds that PTUN did not have adequate authority to examine the president's policies. As a mandatory of the People's Consultative Assembly (MPR), PTUN considered the president accountable only to MPR, in which the lawsuit was subsequently dropped. A year later, the loan from the Reforestation Fund was converted into government shares in IPTN, eventually unhooking IPTN from any obligation to return the money.

Many people were curious as to why the N250 project was worth more than the need for reforestation. This can only be answered by noting factors of power from which many of Suharto's authoritarian decisions were drawn. As discussed earlier, there was an eagerness to present the N250 prototype as a birthday gift to the nation during the anniversary. While it may seem that the decision was made to celebrate the golden year of Indonesian independence, I would like to argue that what Suharto and Habibie sought to achieve was a reverse impression. It was not that the N250 was dedicated for the 50th Anniversary. Rather, the golden year celebration was intended to imbue the N250 with special meanings. By placing the N250 at the special moment in the 50th year of Indonesian independence, Suharto and Habibie wished to impose nationalistic attributes upon the whole process of the airplane's creation. The objective of their machinations was to synchronize the technological accomplishment in the N250 and the historical meaning of the 50th anniversary. In other words, the special event was meant not only to celebrate a half century of political independence but also the beginning of technological independence. This was precisely what Habibie had envisioned in his four-step transformation in which the N250 program was carried out to mark an era where Indonesia was able to develop its own technology without reliance on foreign assistance. What constitutes this idea of technological independence will be further discussed after the following section.

Fly-by-wire

One day in 1992, Bambang Pamungkas received a long-distance call from Britain. Speaking from the other end was his boss, Habibie, who summoned Pamungkas to fly to London as soon as possible. His presence was expected at a meeting Habibie had arranged with an electronics company scheduled two days

later. Pamungkas was anxious as to whether he could make it. He was still in Bandung when Habibie called him. He had only one day to make preparations for the trip including making arrangements for visas, travel, packing, and the care of his family while abroad for his seemingly important trip to the United Kingdom. But Habibie assured Pamungkas that everything had been taken care of and he did not have to worry. The British Embassy in Jakarta would contact him to arrange his travel document. In the afternoon the following day Pamungkas departed from Sukarno–Hatta International Airport and arrived in London early in the morning on the meeting day. Still experiencing jetlag, he entered the meeting room at eight o'clock where a team of engineers from Lucas Aerospace waited. This meeting was extremely important for the N250 program. It was a first step in the development of the fly-by-wire technology, a distinctive feature that would make the N250 the most advanced regional commuter in its class.[19]

Developing fly-by-wire was a lofty task for Pamungkas who had been an engineer at IPTN since the early days of the company. He was trained as an electrical engineer at Institut Teknologi Sepuluh November (ITS) in Surabaya before he joined Pertamina and later transferred to IPTN. For years, he had been one of Habibie's most reliable engineers at IPTN. When Habibie asked him to conceive the fly-by-wire flight control system for the N250, he was not entirely confident. It was alien to IPTN engineers. Other than Habibie, no one at IPTN including Pamungkas had ever heard, let alone learned, about this control system. Since Habibie had insisted on equipping the N250 with this flight control system, Pamungkas had to comply. Three other engineers were assigned to help Pamungkas. They became the core team specially tasked to do the job. They were: Irsal Rinaldi in charge of electronic controls; Elka Sunarkito in charge of the mechanical linkage system; and Diny Ibrahim, a female engineer who became the star of the team for successfully designing the software for the fly-by-wire system.

Three months after the London meeting, IPTN signed a contract with two suppliers, namely British Lucas Aerospace and German Liebherr-Aero-Technik GmbH. The development and production of the fly-by-wire flight control system required a process so complicated that it necessitated collaboration with an electrical company and an aeronautical supplier to design and manufacture the system in accordance with IPTN's requirements. It is worth noting that none of the suppliers were acquainted with the fly-by-wire technology prior to this project. Thus, the task was as much a challenge for IPTN as it was for the suppliers. It took almost three years for Pamungkas and his team to complete their assignment. The components were entirely produced by the suppliers. But the design process of the system was undertaken in Bandung by IPTN engineers who met regularly every morning to define every detailed feature embedded in the system. The defined requirements were then sent to Lucas-Liebherr to be implemented into physical instruments. When completed, it cost approximately US$12 million to design and produce the fly-by-wire-based flight control system for the N250.

In a nutshell, fly-by-wire is a flight control system that provides fully powered, electrically controlled hydraulic servos both for primary and secondary

control surfaces of an airplane. In the N250, the fly-by-wire control system covers three axes: directional, lateral, and longitudinal. The motion of the airplane towards these axes is determined by the control surfaces consisting of one rudder for yaw directional control, two ailerons for roll control, two elevators for pitch control, four flap panels for taking off and landing, and four spoiler panels for roll control supplementing ailerons (see Figure 6.1). Nine small computers called the Electronic Control Unit (ECU) were installed in the aircraft. Except for the flaps, each surface was connected to two units of ECU. These computers functioned to transfer commands from the pilot to the surfaces. Thus, the pilot no longer controls the airplane motion manually through mechanical links as commonly used in conventional flight control systems. Every command from the pilot is processed digitally by the computers and transmitted to the surfaces in real time. The utilization of fly-by-wire in the N250 gave two distinct advantages, making the N250 superior to other aircraft in its class. First, it greatly reduced the aircraft's weight because metal components used in mechanical control system such as rods, interconnection units, cranks, and so forth are now replaced by wires. By reducing its weight, the fly-by-wire enhanced the plane's speed. Equally important is that the use of computers enhanced flight smoothness. The computers were programmed not only to receive inputs from the pilot, but also to manipulate the inputs based on a mathematical model so as to enhance the quality of flight. The outputs from the computer were electronically sent to actuators linked to control surfaces. To maintain the sensitivity of controlling the aircraft for the pilot, the interface between the pilot and the N250

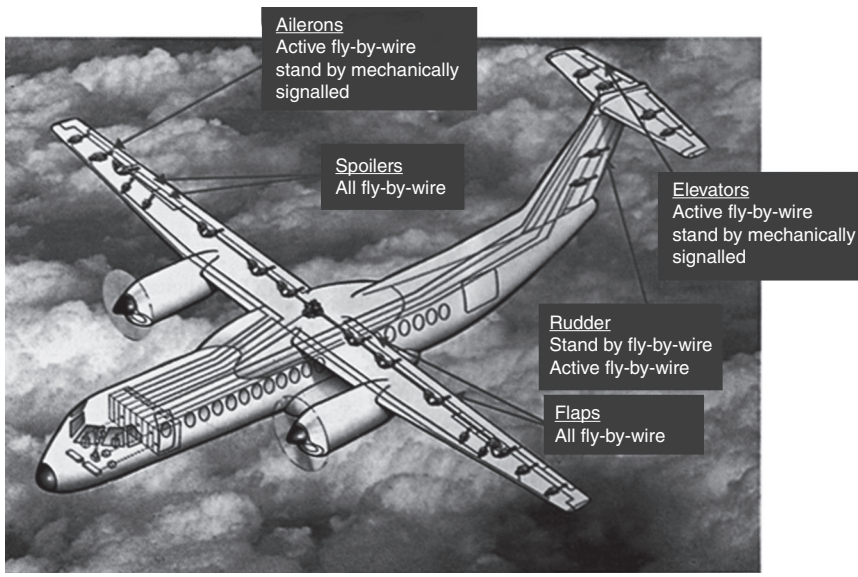

Figure 6.1 The fly-by-wire flight control system developed for the N250 (source: IPTN documentation).

control system was designed with an artificial field, which functioned to give force feedback to the steering wheel.

The N250 was not the first plane to use fly-by-wire. Such electrically powered control systems were common in flight control systems for transonic aircraft. Nevertheless, the N250's fly-by-wire was considered a significant breakthrough in aircraft flight control technology for subsonic commuters. When IPTN introduced the fly-by-wire, a similar system had, in fact, been utilized in Sweden-made Saab 2000. However, Saab's fly-by-wire was built for single axis only. In terms of subsonic commuters, the N250 pioneered the three-axis fly-by-wire control system. Consequently, IPTN engineers had to experience the cumbersome process of trial and error. As Pamungkas put it, "We were like walking in the dark. The only guidance we had was Habibie. He remained optimistic, so we proceeded. Otherwise, we would not have completed the job."[20] Indeed, Habibie's influence on the entire project is reflected in his involvement in the development of the N250's fly-by-wire. His insistence to utilize fly-by-wire in the N250 was due to technical reasons. As noted earlier, the N250 was designed as a subsonic aircraft with a speed pushed up to the upper limit. Moving at the maximum subsonic speed risks aircraft stability and relying on a manually controlled flight system certainly jeopardizes flight safety because of the high probability of human error. Therefore, the aircraft requires an electrically powered flight control to minimize fragility and to avoid mistakes made by the pilot. The use of computers in correcting pilot commands through the software designed by Pamungkas's team allowed this to be achieved. This was a groundbreaking innovation.

From the outset, it was the aim of the N250 program to improve the skills of IPTN engineers, not only in acquiring new technical knowledge and know-how but, more importantly, in producing substantial innovations. The ability of Pamungkas's team to design and to create a new flight control system that did not exist in the market attested the accomplishment of this goal. This does not mean that no other aircraft manufacturers had considered building a flight control system similar to that of the N250. None had been developed because fly-by-wire had a high risk of failure. Pamungkas explained that even a leading aircraft industry like Boeing had not decided yet to utilize fly-by-wire in their aircraft. They preferred to take gradual steps in developing their flight control systems. IPTN took risks where other more established aircraft manufacturers were more cautious. For instance, Saab started from single axis, not three axes like IPTN bravely did. The decision to start with using three-axis fly-by-wire gave the N250 some advantages. When Saab developed a single axis fly-by-wire, the system was interfered with by longitudinal stability. This problem did not plague the N250 since all the axes are electrically controlled.[21] Creating a more advanced flight control system was essential for increasing the competitive advantage of the N250 in the market. Acting as the chief designer of the N250, Habibie demanded the N250 team make an engineering breakthrough in aircraft technology that allowed IPTN to catch up with more advanced industries. Said D. Jenie, MIT-educated flight test engineer at IPTN, stressed that the success of

the N250 laid in pursuing this end. By using such a control system, the N250 outperformed its fierce competitor, Saab 2000. Furthermore, Jenis argued that IPTN had pioneered the development of a technical system of which many in the aircraft industry community regarded as unfeasible. Jenie noted:

> Time has shown that what Habibie had envisaged [of the use of fly-by-wire flight control system in the future] is now a growing trend in many aircrafts after the N250. This elevated IPTN's previous status at the edge of flight control technology for subsonic commuters.[22]

There were a number of innovative attributes developed for the N250 aircraft. However, fly-by-wire constituted the main feature that rendered the N250 the most competitive commuter in its generation. The fly-by-wire had more significance than other technical aspects of the airplane. It became an important feature in distinguishing N250's image and symbol as a superior artifact. Consider this statement that appeared in an Indonesian newspaper:

> [The N250] flies with fly-by-wire system, which is obviously superior to its competitors because it is *the first aircraft in the world* to use the fly-by-wire control system.… With a digital control system called FADEC (Full Authority Digital Engine Control), the safety and comfort of the N250 are much better than its competitors.[23] [emphasis added]

The excerpt above was among a plethora of news reports on the N250, which often included comments of the fly-by-wire control system in enthusiastic tones. The media was unreserved in praising this locally designed technical system, emphasizing the N250 as "the first aircraft in the world" to use such a sophisticated technology. The media even went further in asserting the N250 as a giant step in placing Indonesia among the world's leading high-tech nations. Here, the ability of producing technical innovations as seen in the use of fly-by-wire was once again used to reaffirm state supremacy. Once again, this discourse links the materiality of fly-by-wire to the supremacy of the state-directed industry in having the ability to produce such an impressive technical innovation.

Rebirth of the flying hero

It was a bright morning at Husein Sastranegara Airport on 10 November 1994. The weather seemed friendly in a cloudless blue sky as if it welcomed the historic event that was about to unfold. Red and white banners cheerfully fluttered at every corner, greeting those entering the site where a memorable ceremony was going to take place in front of one of the hangars at IPTN. It was the roll-out of the N250 first prototype, named by Suharto after *Gatotkaca*, a heroic character in Hindu-Javanese mythology—hereafter, Gatotkaca and N250 are used interchangeably. This was the first debut of *Gatotkaca* since its inception six years earlier. All IPTN engineers, especially those directly involved in the

project, were looking forward to this moment. But nobody was more anxious and excited than B.J. Habibie, the initiator and chief designer of *Gatotkaca*.

Before noon, the New Order leader President Suharto and Mrs Hartinah Suharto, popularly known as Ibu Tien, arrived at the airport where Habibie along with his wife and other members of the New Order cabinet waited patiently. Five men in yellow outfits energetically played Sundanese drums with gamelans and traditional trumpets, welcoming the New Order strongman. After shaking hands and exchanging smiles, Suharto and Habibie headed to the front of a blue-painted hangar where nicely suited VIPs were waiting under a huge decorated tent. Behind them were 1,000 ordinary visitors, journalists and IPTN employees who were excited in anticipation of witnessing the show. After Habibie and Suharto gave their speeches consecutively, the "sacred" ceremony began. The twin doors of the hangar slowly parted, allowing yellow smoke to flow out from the inside, a spectacle that conveyed a political nuance associated with the New Order party, Golkar, whose official color is yellow. From the dispersed smoke appeared the nose of the N250. In a minute, the white-blue body of the airplane was completely visible to the audience as it was slowly towed out. Hundreds of onlookers watched in amazement, applauding enthusiastically. Two lines of 19 men wearing uniforms with yellow hats led the N250 out. They walked out of the hangar together holding a rope tied to the airplane, appearing as if they were pulling out *Gatotkaca* by hand. All this while, a choir was chanting *Syukur*, a national hymn of thanksgiving prayer that elicited sublime feelings of national pride from the audience. Soon a man's voice over the loudspeaker uttered a poem written by Habibie five days earlier in celebration of the birth of *Gatotkaca*. With graceful elegance, *Gatotkaca* moved slowly, showing off its body as it passed by the audience. The crowd just stared at the airplane in amazement. After rolling 100 meters to the left, *Gatotkaca* made a U-turn as the choir started singing *Padamu Negeri*, a song that expresses devotion to the nation, creating an ambience of high patriotism at the scene. After wheeling back toward the audience, the plane stopped in front of a two-meter high platform. Suharto, Habibie, and Vice President Try Sutrisno stepped onto the stage. As Sutrisno and Habibie watched at his side, Suharto poured flower-scented water over *Gatotkaca's* nose from a jasmine-decorated earthenware pitcher. When the pitcher was empty, Suharto released his grip, letting it fall and break into pieces on the ground. According to the Javanese tradition, this gesture signifies a relationship between Suharto and the N250, symbolizing a father blessing his baby and praying that the baby will be safe, healthy, prosperous, courageous, and long-lived. Suharto then stepped across the stage, reaching the left-hand side of the turboprop aircraft under the cockpit area on which a piece of one-meter square foot red-edged white curtain was mounted. He pulled down the curtain to reveal what was underneath: a glaring golden-inked picture of the flying hero *Gatotkaca*. Suharto gently clapped his right hand on *Gatotkaca* a couple of times as a father does to his child's head before turning his face back to Habibie with a happy and satisfied smile. Habibie smiled back proudly, for he was the man behind the N250 project. Suharto, Sutrisno, and Habibie entered the airplane and

walked into the cockpit cabin. Suharto sat at the pilot seat with Sutrisno at the co-pilot, reflecting their political hierarchy. Standing low between the seats, Habibie enthusiastically explained the advantage of *Gatotkaca*'s control system. About ten minutes later, they left the airplane. As Suharto walked down the stairs, he raised his right hand thumb upward, exhibiting his full satisfaction of the N250 to the audience.

The N250 roll-out ceremony was significant to the efforts of the New Order in showcasing the attainment of technological independence to the public. Following Maurice Charland's (1986) description of the physical and discursive elements of technological nationalism, the presence of IPTN as a project of technological nationalism achieved a concrete form through state-orchestrated ceremonial procession. It constructed a modern image of the state that involved a fusion of mythology and modernity. This is an expression of what John Breuilly (1994) notes in his investigation on the sources and forms of nationalist ideology on which the state relied to generate legitimacy. Breuilly explains that ceremonies and symbolism give nationalist ideas a definite shape and force by projecting potent images that persuade people to embrace the state as guardians of the nation. This is made possible by a quality of self-reference embedded in nationalist symbolism.[24] Following this line of argument about the way nationalist symbolism and ceremony embodied the reinforced alignment of high technology and the New Order regime, it is imperative to probe two main attributes attached to the N250 roll-out ceremony that played a pivotal role in the techno-cultural representation of the state. These attributes were the name "*Gatotkaca*" and the commemoration of the Patriots Day. The combined presence of these features

Figure 6.2 The N250 roll-out ceremony (source: IPTN documentation).

were not accidental, but carried particular cultural meanings from which high technology set the stage for the state to assert its power.

Gatotkaca is a heroic character in the Mahabrata epoch. The tale of Gatotkaca appears in the plot of Priggadani Kingdom, which tells a story of two families involved in a conflict, the Kurawa and the Pandawa. In a war, King Arimba of Kurawa was killed by Bratasena of Pandawa who later married Arimba's sister, Arimbi. Born from the marriage was a child named Gatotkaca. During the birth of Tetuko, Gatotkaca's baby name, Arimbi had difficulty in cutting Gatotkaca's placenta. She used an arrow case to cut the placenta off. But the arrow case accidentally penetrated the baby's navel and stayed inside permanently. The baby Gatotkaca was then thrown into Candradimuka crater where he was bestowed supernatural power. Soon, Gatotkaca grew into a big and strong man. His muscles developed and were tough like wires and his bones turned solid like steel. According to the myth, Gatotkaca was a hero who possessed the ability to fly. Endowed with superpowers, Gatotkaca became the King of Pringgadani. During the Bharatayuda war, Gatotkaca led his army to fight against the Kurawa. In a decisive battle, Gatotkaca was magically killed by his enemy.

In the Javanese tradition, the story of Gatotkaca and other stories in Mahabrata are performed in *wayang* (shadow puppetry), an all-night-long performance led by a *dalang* (storyteller) and accompanied by *gamelan* music. Like most Javanese, Suharto enjoyed the *wayang* performances. During his reign, he often ordered the national television station, TVRI, to broadcast *wayang* shows that ran all night long. For Suharto, *wayang* was not mere entertainment. It was a source of philosophy and virtues in his life. In fact, many of Suharto's political decisions were inspired by episodes in *wayang*. He even once referred himself as Semar, a wise old man and advisor of Pandawa knights. It was Suharto's high regard of *wayang* performances that motivated him to name CN235 after Tetuko and used a series of the flying hero's names in four N250 prototypes: *Gatotkaca*, *Koconegoro*, *Krincingwesi*, and *Putut Guritno*. For Javanese people, who constitute the largest ethnic group in Indonesia, Gatotkaca is a symbol of patriotism and devotion, using his power only for the sake of his nation and people. IPTN itself was often metaphorically referred to as Candradimuka crater, a place where Gatotkaca obtained his power.

Upon closer inspection of this mythological element, naming those aircraft after the flying hero had an intentionally engineered effect of invoking a mythology which the state exploited to inscribe a set of perceived values and virtues into an awe-inspiring technological artifact. The mythology serves to bestow symbolic meanings upon the materiality of high technology. The name of Gatotkaca was not just an attempt to reify the flying hero. As suggested by Partha Chatterjee (1993), it also has the effect of fusing two separate worlds in one medium.[25] One world is material, the other spiritual. The former is characterized by rationality, physics, and facts, products of modernity closely linked to Western culture. But the embrace of modernity through the development of the aircraft industry in Indonesia does not necessarily mean that Indonesia is, or wishes to be, fully "Western." The rational forms of technology adopted from

the West must be reinterpreted through Javanese mythology, which engenders a specific meaning of indigenous creation. This is the purpose of the Gatotkaca symbolism, bringing virtues, values, and essence to achieve a balance in technological construction. The mythology of the flying hero into the N250 served to "localize" the aircraft as a creation that was no longer spiritless. Now the N250 has a "soul" that reflects a state of perfection combining modernity and Indonesian values. Furthermore, inscribing Javanese symbolism on IPTN's technological artifacts is a form of revivalism reflecting a firm conviction in the virtues of ancient civilizations in which the New Order Indonesia was culturally rooted. This is seen in a popular juxtaposition of the N250 and Borobudur, the world's largest stupa erected around the late eighth century by an old kingdom in Central Java. Andi Alisjahbana, head of aircraft system design at IPTN, claimed that the N250 is the second magnificent achievement of Indonesia after Borobudur.[26]

While the Gatotkaca symbolism links the state's technological project to a celebrated mythology, another feature of the ceremony establishes a connection to the Indonesian sense of acute patriotism. A temporal dimension becomes crucial at this junction. The roll-out was intentionally set to take place on the commemoration of Patriots Day. Precisely 49 years before on 10 November 1945, an incident in Surabaya broke out where thousands of Indonesians died fighting against the Dutch, who attempted to reoccupy the archipelago after the end of World War II. The day is celebrated every year as Patriots Day. The whole procession of the N250 roll-out was deliberately performed in a meticulous manner, an embodiment of patriotism, meant to evoke patriotic feelings among the Indonesians who witnessed the event. It sought to deliver a message that the N250 was an accomplishment as patriotic as the Surabaya victory. While the youth of Surabaya was able to keep the republic's independence from being taken away by the colonial force, a bloody struggle that cost many lives, the young generation at IPTN succeeded in achieving independence, not in the political but in the technological domain. The devotion and sacrifice displayed in the two events were equally valued. Habibie gloriously highlighted this comparison in his opening speech at the roll-out ceremony in which he introduced the N250 as a remarkable endeavor undertaken by *Generasi Penerus* (succeeding generation) that was very much inspired by patriotic courage of *Generasi '45* (the generation of 1945 revolution). Habibie remarked:

> [The succeeding generation] has victoriously acquired science and technology independently with the spirit of the 1945 revolution. It resulted in the hi-tech based N250, which is an indication that this generation is ready to continue the struggle of the nation. The succeeding generation develops technology as a concrete contribution to the continuous national development in order to materialize Pancasila.[27]

In his address to the audience attending the roll-out ceremony, Habibie spoke of a transformation of patriotism from anti-colonialism of the old generation to technological advancement of the succeeding generation. He differentiated the

tasks of the two generations that were shaped by different historical challenges. If the old generation's mission was to fight for freedom from the Dutch colonizers with blood and lives, it was the main task of its successors to harness the freedom[28] through systematic development efforts for the purpose of generating and ensuring prosperity. IPTN engineers were part of the succeeding generation whose main task was to develop high technology that would advance the well-being of the nation. Yet, Habibie and his adherents believed that technological development was an arena that is often highly contested and competitive. In this perspective, technological acquisition is not as simple as many people would have assumed; it requires certain tactics and strategies in order for a country to be able to enter and survive competition in the field. Just as independence resulted from the struggle of the old generation against the colonial powers, the succeeding generation has to struggle against the acquired technologies from Western nations in order to achieve independence in technology development. This juxtaposition of political independence and technological independence cast the post-war Indonesian revolution and the technological development undertaken at IPTN in the same light imbued with similar meanings. The roll-out ceremony was engineered to glorify the success of the state-directed IPTN in producing the N250, which was seen to have marked a turning point in Indonesia's pursuit of technological independence. The term "technological independence" does not necessarily imply the complete absence of foreign industries in developing national technology. Habibie realized that international assistance was crucial for IPTN to turn *Gatotkaca* into reality. The expression "technological independence" is better understood to be referring to the opportunity Indonesian engineers had seized in showing their competence and ability to carry out what was considered nearly impossible by many Indonesians. The N250 was a testimony of how this opportunity was seized and developed successfully. For their tenacious efforts, IPTN engineers were treated as patriots who deserved homage for their struggle in achieving technological sovereignty through the independent production of an advanced technological artifact. Suharto called them "pioneers, fighters, and development heroes" who had been successful in "taking over [from Western nations] and mastering sophisticated technology."[29] Describing the N250 roll-out ceremony as the apotheosis of technological nationalism, Habibie defined the N250 completion as a sign of the rise of a new breed of Indonesian engineers who were qualified to carry on what the New Order had accomplished in transforming the Indonesian economy:

> It is a present from the succeeding generation that has persevered under the guidance of the spirit of the 1945 revolution to create a superior technological product as a sign of their preparedness to resume the nation's struggle, anticipating the future globalization and the interdependence of technological application and development among nations in the world.[30]

How did the procession of the N250 roll-out reflect the nature of the New Order technological state? How significant was the role it played in reinforcing the

existence of the technological state? Three decades ago, Clifford Geertz published an outstanding work discussing the concept of "the theatre state." It is an anthropological study of *negara*, a form of polity prevalent in nineteenth century Bali. Negara is a Sanskrit word now used in the Indonesian language to mean "state." In *Negara*, the title of Geertz's book, he described how ceremonies and rituals, meticulously organized to evoke grand feelings, became the ultimate goal the theatre state sought to achieve. This interpretation was a response to the mainstream political studies of state that Geertz accused of neglecting or ignoring one of the most decisive elements in the existence of state power, namely the symbolic. The main argument Geertz stressed in *Negara* is that state power comprised not only of political economic forms and means for physical violence used to dominate individuals, but also the institutionalized ability to display power through symbolic means. It is the symbolic channel that, according to Geertz, facilitates "an illustration of the power of grandeur to organize the world."[31] Symbolic expressions, Geertz further argued, are by no means delusive; they mediate the translation of the imaginary into the real for which the theatre state is "designed to express a view of the ultimate nature of reality and, at the same time, to shape the existing conditions of life to be consonant with that reality."[32] It is this conjunction where "the state drew its force, which was real enough, from its imaginative energies, its semiotic capacity to make inequality enchant."[33] The power effects of symbolic performances are enormous for the state. If one wishes to extend this observation, it is apposite not only in the Balinese state but also in contemporary modern states where the use of symbolic methods remains ubiquitously observable in the way the state maintains hegemonic relations with its citizens. Despite criticisms of Geertz's *Negara*,[34] the relevance of symbology in Geertzian's theatre state to the technological state cannot be understated. It emanates from the argument that the symbolic is an extremely significant *modus operandi* for the New Order technological state to transform the entire materiality of high technology into a perfect configuration that corresponds to the Indonesian psyche. Every single part of the roll-out celebration and the inscription of Hindu-Javanese mythology on the high-tech artifact resulted from the realization of the totality of authoritarian power the New Order had accumulated since its rise, which it now sought to legitimate. Poetic words, colorful banners, exuberant performances, sacred procession, and rhetorical speeches were placed and arranged in a particular composition that resembled a theatre in which the spectators were confronted, awed, and tantalized with the grandeur of high technology indigenously imagined, planned, designed, and built. It was in the grand appearance of the N250 through the animated ceremony that the technological state came alive. The elegance, beauty, strength, and superiority of the N250 exhibited through a massive ceremonial presentation thus embodied state power. In sum, power in the technological state involved not only institutional and material forms that underpinned the whole process of high technology production and advancement, it also relied on a repertoire of symbolic registers from which the technological state drew its supremacy and legitimacy.

Maiden flight

A few days before the N250 was scheduled to make its first flight, a provoking report appeared in *Asiaweek*. Quoting an official from IPTN, the Hong Kong-based magazine revealed that the airplane was months away from being ready for public flight. The article discussed Habibie's insistence to test the N250 publicly as a careless decision that would risk his entire reputation and career. If an accident was to occur during the testing of the aircraft, said the article, it would ruin Habibie's political career and "it is unlikely that President Suharto will be able to save his old friend."[35] The article instantly stirred up anxiety among Jakarta elites, most notably those closely associated with Habibie. Amien Rais, then head of ICMI Expert Board, took *Asiaweek's* report seriously. He was also concerned about the possible effects should the N250 airplane fail to fly. He was worried that not only would Habibie, IPTN, and ICMI fall along with the N250, it would also make a mockery of Indonesia.[36]

The anxieties *Asiaweek* created would not have arisen were it not for an unexpected incident. In a weekly cabinet meeting attended by all New Order ministers, Habibie delivered a report to Suharto that the N250 would be fully prepared to take a flight test by August 1995. He proposed 17 August 1995 as the D-day, precisely 50 years after Sukarno and Hatta proclaimed Indonesian independence in 1945. Suharto was pleased to hear the news but did not like the proposed date. He had planned to announce the success of the N250's first flight in his annual address to MPR, which was usually held on 16 August. Suharto then suggested that Habibie arrange the maiden flight of *Gatotkaca* for 10 August 1995, seven days before the commemoration of Independence Day. Habibie had no objections at all. But to his surprise, Suharto said that he was deeply interested in observing the maiden flight by himself given the remarkable importance of this test. For Suharto, who followed the development and construction progress of *Gatotkaca* closely, the first flight was a huge moment he would not miss. It was a testament to the entire New Order's venture in high technology. As the chief engineer of the project, Habibie completely understood Suharto's excitement. But a greater surprise was in store for him when other ministers of the Cabinet also decided to come along with Suharto to Bandung to witness the first flight. Habibie could not say no to his fellow ministers who were all curious of what Habibie had done in IPTN. In a short time, news of the N250 flight test somehow leaked to the mass media and quickly spread to the public. And this was how the N250's maiden flight, which ought to be carried out in secret for safety reasons, turned into a public show viewed by the whole country.[37] Once again, the theatre state mode was switched on where the public was to observe the action of technology in an unusual performance.

As the first flight now became a public event, it worried a number of Habibie's foreign advisors who were involved in the project. Paramajuda recounted that a senior engineer from MBB suggested that Habibie postpone the N250's first flight for two months after he carefully checked the status of the airplane. Another expert from Boeing said that the probability of N250 succeeding in its

first maiden flight was only 20 percent. Therefore, he concurred with his colleague from MBB that Habibie ought to reschedule the first flight for two or three months after the original planned date.[38] A differing opinion came from Boris Laschka, an old friend of Habibie who had assisted IPTN from the beginning. Laschka, who had expertise in aerodynamics, felt confident that *Gatotkaca* would be able to fly, for all the simulations he had conducted indicated no potential troubles. He was nevertheless surprised that the first flight was made public and warned Habibie of the potential damage resulting from this unusual practice.[39] Habibie was fully aware of what would happen if the plan did not work. But he refused to delay the flight test because, as discussed previously, timing was extremely pivotal to the symbolic success of the N250. To reduce the risk of failure, he formed a task force of 14 engineers led by Hari Laksono. This group was specifically assigned to ensure every single detail pertaining to the first flight test would go well.[40] As the date for the first flight was approaching, all the team members of the N250 worked 24 hours a day, seven days a week. To complement all the rational and technical preparations, Habibie also sought spiritual force and help to ensure a successful flight test. While doing prayers with IPTN employees in the company's mosque in the evening before the event, he admitted that he had been fasting for ten days as a means to seek for the blessing from Allah for a successful flight test of *Gatotkaca*.[41]

On the morning of 10 August 1995, Husein Sastranegara Airport was packed with hundreds of eager journalists, both foreign and domestic, carrying the best cameras they had. They did not want to miss a single event on that day. The *Asiaweek* article apparently helped to boost the publicity of the flight test. Around 9 o'clock, Suharto and his entourage arrived at the location where Habibie along with the vice president, the other Cabinet members, representatives from neighboring countries, and other invitees were waiting. Before heading to the control tower, Suharto and Habibie came to greet the four crew members for the flight test: test pilot Erwin Darnuwinata, co-pilot Sumarwoto, flight test engineer Hindrawan Hary Wibowo, and flight test instrument engineer Yuarez Riadi. As the crews were entering the plane, Suharto, Habibie, and a small group of VIPs moved up to the tenth floor of the newly constructed control tower. While spectators in the location nervously waited for the monumental moment, millions of Indonesians were also observing the extraordinary spectacle on television screens. They were as proud of the accomplishment as the American people had been about the Apollo's moon landing more than two decades earlier.

Precisely at 9.40 a.m., Captain Darnuwinata started the airplane engine that rapidly spun a pair of Dowty-branded propellers. After a few moments, *Gatotkaca* left its position slowly moving toward the runway. As the pilots accelerated the speed attempting to take off, everybody held their breath. Before reaching the end of runway, *Gatotkaca's* front wheels lifted up. In less than five seconds, it took off and flew perfectly. This instantly brought a great relief to everybody, especially to Habibie and his engineering team. The flying hero was now alive. The crowd spontaneously burst into cheerful applause. Suharto

happily congratulated Habibie with a tight handshake and a warm hug. For 56 minutes, *Gatotkaca* flew through the Bandung sky, capturing attention from citizens of the city. During the flight, Suharto conversed with Captain Danuwinata via radio. His teary eyes clearly showed his tremendous happiness and pride at that moment. This was perhaps the first time the most powerful man in Indonesia had shed tears in public. In a press conference after the flight test, Suharto proudly remarked that the successful flight was a watershed moment in Indonesian history because it confirmed the country's capability in designing and producing its own modern airplane. This achievement, Suharto further noted, raised national confidence in Indonesia's ability to face the future with full optimism.[42]

The N250's successful flight caught international attention. Shortly after the event, Airbus Industrie released a press statement that read: "The Airbus Industrie is pleased to be associated with the first flight of the IPTN N250 turboprop airliner, which was completed successfully in Bandung, Indonesia." The company had been involved in the N250 program by providing a technical consultant for the flight test phase.[43] As the world saw the promising prospect of the N250 from its maiden flight, it had international implications for the global aircraft industry. For instance, as Habibie informed the press, the stock price of Fokker, which produced the rival aircraft to the N250, substantially dropped after *Gatotkaca* made its successful maiden flight, while a number of corporations become interested in having commercial collaborations with IPTN.[44] The domestic scene was overwhelmed by a great euphoria. The fear of failure that had overshadowed the historical moment turned out to be unwarranted. But this did not really surprise IPTN engineers who were directly involved in the project. They informed the press that some technical glitches in the N250 unexpectedly cropped up a few weeks before the flight test. But as the test day approached, these engineers were able to resolve the problems in time for the flight test to go ahead smoothly as planned.[45] For those who had been immersed in the bleak

Figure 6.3 The N250's first flight in Bandung (source: IPTN documentation).

prediction in *Asiaweek*'s article, the successful flight of the N250 was something of a great surprise. "It was a miracle," Amin Rais put it. He praised the role of Habibie as the main factor in the miracle, and believed the remarkable success could not have been accomplished otherwise.[46] Such an expression gave a tremendous boost to the reputation of Habibie and his team. More importantly, this unprecedented achievement vindicated the high technology vision they had relentlessly promoted for years; it washed away the skepticism and cynicism of politicians and technocrats who strongly disagreed with the agenda of the technological state. As two members of the parliament shared their feelings to the daily *Media Indonesia*, "the triumph of the N250 attested what Habibie had tenaciously planned and implemented for years." They believed that the N250 was not merely a lighthouse project because it would bring further benefits and advantages for Indonesia as a developing country seeking to advance its economy with high technology.[47] In a similar manner, the euphoria seemed to integrate and unify the political elite in joyfulness and pride, including those who were against the project. Taufiq Kiemas,[48] a parliament member from the "opposition" Indonesian Democratic Party (PDI) who often criticized high technology projects run by the Habibie group, unabashedly expressed his pride and amazement of the N250. He attended the first flight in person and shed tears when watching the N250 taking off smoothly.[49]

The impressive attainment of IPTN in presenting Indonesia with an indigenously designed aircraft brought about praises from everywhere. It came as no surprise that the immediate credit went to Habibie. Upon recommendation and nomination from Golkar-affiliated *Generasi Muda Gakari*, the New Order government conferred Habibie the most prestigious award of *Bintang Maha Putera* for his leadership not only of the N250 program but also the entire efforts of the New Order in building the national capacity in developing high technology.[50] Although Habibie suggested that the young engineers at IPTN deserved the credit,[51] this award provided Habibie with an opportunity to cultivate a patriotic image, boosting his already strong symbolic power. The highest recognition of what IPTN had accomplished in the N250 project first came interestingly from a conservative Islamic organization *Persatuan Islam* (United Islam, Persis). At its tenth annual conference, the board of Persis decided to propose that the government commemorate the day the N250 took off as Technology Awakening Day. Persis believed that the event was worth remembering because the N250 was an indigenous creation of Indonesian sons and daughters that engendered high pride for Indonesia in general, and for Muslims in particular.[52] A month later, the Indonesian Engineers Association (PII), a professional organization led by Development Planning Minister, and Habibie's close ally, Ginandjar Kartasasmita brought up a similar proposal. In a meeting with Suharto, Kartasasmita threw the idea of celebrating the Technology Awakening Day every 10 August. He reasoned that what had transpired on that day was extraordinary and that it confirmed "the capability of Indonesian engineers in creating a technological artifact that only developed countries could make."[53] The proposal was quickly accepted and implemented. The New Order government stipulated that starting

in the following year every 10 August would be venerated as the National Technology Awakening Day. This gave the N250 remarkable significance in the consolidation of the technological state in Indonesia, for it unprecedentedly infused the cultural meaning of technology into the national celebration. The term "awakening" suggests that the time has come for Indonesia to wake up from its long hiatus and regain its lost grandeur. In this light, the N250 is viewed as the beginning of a resurrection of the nation's past technological supremacy. "It is National Awakening II," daily *Bisnis Indonesia* called it, making a reference to the rise of Indonesian nationalism in the early twentieth century.[54] It had the effect of increasing the nation's dignity and self-determination. Habibie put it in a sanguine tone, "the [N250] successful flight has enabled us to walk straight showing that we are equal to any nation."[55] The meaning of the technological event on 10 August 1995 is deeper than being merely a technical achievement. It is worth noting that the event took place 30 years after the coup of the 30 September Movement, which was followed by the purge of the communists that gave rise to the New Order regime. For three decades the authoritarian regime had persistently attempted to establish social and political order coercively imposed upon Indonesian society through disciplinary practices. A strong obsession of modernity and commitment to techno-economic progress led the regime to embrace a vision of high technology that laid the foundation of the technological state. Following Rostow's stages of growth, the New Order chose a path of creating an industrialized society with IPTN as the cornerstone. As the technological state grew stronger, the prestigious aircraft industry brought forth its masterpiece, the N250. The airplane was the raison d'être for IPTN and its take-off literally marked the take-off stage the New Order had promised. In retrospect the N250 first flight arguably marked the apex of the New Order's decades-long authoritarian power before it began to decline two years later.

Global expansion

From the outset, the New Order technological state aimed at turning the country into a high technology powerhouse with an adept capacity to compete in the globalized economy. As the N250 was deemed to signify the attainment of technological independence where Indonesia could now rely on its own in producing highly competitive technologies, the regime grew in confidence to begin penetrating foreign markets as the Asian Tigers, most notably Japan and South Korea, had done before. Hence, the N250 became an experiment for the global expansion of Indonesian-made high technology. There was a strong reason why IPTN as the flagship of Indonesian high-tech industries embarked on such an unprecedented penetration. When it was first launched, the N250 appeared in many ways the most superior aircraft in the subsonic category suitable for middle-range commuters. Its speed, comfort, and size were a perfect combination unmatched by existing products. According to the market study conducted by the IPTN team, the demand for 70-seater airplanes from 2000 to 2020 amounted to 4,500 units.[56] IPTN was determined to sell around 707 units of the N250, which meant

18 percent of the market share. This number comprised of 400 for domestic needs and 307 for abroad. One of the lucrative overseas markets IPTN decided to enter was the United States, which constituted one-third of global demand. At that point, no airplane makers in North America produced 70-seater airplanes but the demand for this type of planes was high.[57] It was this gap that IPTN's N250 was intended to fill. To facilitate this plan, IPTN opened a branch office in the state of Washington where a joint venture was established with Boeing, resulting in a subsidiary called IPTN North America (INA). The INA office was located in the Boeing complex in the center of Seattle. One of the primary tasks assigned to INA was to set up AMRAI (American Regional Aircraft Industry), a spin-off company that was supposed to tackle the marketing of N250s in North America, particularly in the United States. If the plan proceeded smoothly, the majority of AMRAI shares would belong to INA and the rest were to be sold to other interested parties. General Electric was one of those that showed keen interest in joining the venture.

Marketing N250s in North America seemed unrealistic if the entire process of manufacturing stayed in Bandung. The production costs were likely to be too high, which would cause the N250's price tag less competitive. Habibie resolved this dilemma through a plan of establishing a manufacturing facility in the United States. For this unusual scheme, Habibie boasted that a corporation from a developing country with a manufacturing facility in the United States was clearly unprecedented. The common practice was the other way around; that is, American companies built factories in developing countries such as Indonesia due to cheap labor. Reducing the costs was precisely the main reason behind Habibie's desire for IPTN to open a manufacturing plant of the N250 in the United States. At the beginning of this process, IPTN surveyed several locations in Arizona, Kansas, Utah, and Alabama that offered a suitable environment for the proposed manufacturing plant. To win the heart of Habibie, Kansas Governor Joan Finney flew to Bandung to visit IPTN, seeking to persuade Habibie to pick her state. To the press she said, "We are greatly interested in this plan because the N250 has a bright prospect. We will be pleased if Dr Habibie would like to choose Kansas as the second plant of IPTN in America."[58] But to the dismay of Finney, the decision went to Mobile, Alabama. It was Mobile Mayor Michael Dow who directly organized a team of Mobile officials to convince IPTN. They even renamed a street Gatotkaca Drive and prepared a very elaborate ceremony to welcome Habibie and other IPTN officials when visiting the city.[59] In addition to the Mobile plant, Aircraft Service Lemwerder was designated as the official partner of IPTN for marketing the N250 in Europe.[60] The latter completed the network of IPTN global expansion that sought to reach out into the two largest airplane markets in the world.

The N250 was not the culmination of IPTN's long-term strategic plan. *Gatotkaca* was the third step in the four-step transformation blueprint that Habibie formulated as a model to turn IPTN into a global competitive player in the aircraft production business (see the preceding chapter). There was one more phase involving basic research IPTN was to undertake to complete the whole

transformation process, which if accomplished would fully increase the capacity of the New Order technological state to globalize its products. Harnessing the euphoria of *Gatotkaca*'s successful maiden flight, Habibie held a press conference after the N250 flight where he surprised the audience with an announcement. Seated next to Suharto and in front of the New Order ministers, journalists, and foreign visitors, Habibie unveiled yet another new project. This one was even larger in scale and more advanced in technology. It was a project to develop a 130-seater jet airplane called the N2130. In full support of his most trusted lieutenant, Suharto explained that the N2130 program was urgently needed. He reminded that Indonesia ought not to be complacent for what it had achieved in the N250. Science and technology, Suharto explained, never ceased to advance and if Indonesia felt satisfied with what it had, it would be left behind. If the opportunity was not seized quickly, Suharto argued, other countries would steal it away, which could be disadvantageous to Indonesia's global position. Hence, Suharto completely supported the N2130 program because he saw it not merely as a lighthouse project but a rational strategy for Indonesia to continue in its pursuit of technological progress.[61]

Habibie's oldest son, born and educated in Germany, Dr Ilham Akbar Habibie, was named the director of this more ambitious undertaking. Specializing in aerodynamics, Ilham Habibie was convinced that the N2130 would generate greater advantages for IPTN to expand its shares in the global markets without having to compete in the domain controlled by two giants, Boeing and Airbus. While Boeing and Airbus had established their dominance in the markets of cross-continental planes, the N2130, according to Ilham, was meant to complete the product family of IPTN concentrated on middle-range regional flight. This was a market niche in which smaller aircraft producers such as Canada's Bombardier and Brazil's Embraer sought to fit. IPTN was determined that the N2130 would significantly contribute to strengthening IPTN's position in the regional commuter market. The structure of the N2130 was thus designed to meet the growing international demand for regional commuters as well as to provide supply for the increasing needs of Indonesian air transportation. Thus, new methods, technology, and process were introduced and adopted in the N2130 program, which Ilham and his small team were tasked to organize and oversee.[62] The commencement of the N2130 program right after the first flight of the N250 was not uncontested. A number of IPTN engineers complained that the N2130 started at an inappropriate time considering that the N250 program still required enormous resources to complete. Three more N250 prototypes were still in the pipeline before the aircraft was qualified to receive an FAA airworthiness certificate. The decision to take on the jet airplane program, one engineer criticized, had somehow slowed down the construction of N250 prototypes due to a proportion of resources being diverted to the new product.[63] But Ilham argued that there were no major overlaps between the N2130 and N250 that would have potentially delayed the latter's progress. The engineers who were engaged in the N2130 program, Ilham explained, were mostly new IPTN employees who had recently returned from their study overseas. They constituted

the core team of the N2130 in addition to senior engineers who had completed their work of designing the N250. More importantly, the funding for the N2130 project came from an external source that theoretically did not place a burden on the IPTN budget.[64]

Nevertheless, it is the financing of the N2130 program that raised many eyebrows about this large-scale technological endeavor. The development cost of this jet airplane was estimated at US$2 billion; almost four times the N250's initial budget. There was no doubt the risk of failure was greater, which many observers thought ought not to be placed on state budgets. Suharto and Habibie were aware that IPTN could no longer rely on government subsidies, let alone use the reforestation funds as for the N250, which had damaged IPTN's reputation in the public. Suharto promised to the press, "The development of the N2130 will not be covered by state budget because there are many other programs in poverty eradication that need priority."[65] Neither did this project seek capital from commercial loans. Not using public funds does not necessarily mean that the financing of the N2130 was no less vexed than that of its sisters. To underwrite the program, Suharto had prepared a bizarre scheme. A company named DSTP, standing for *Dua Satu Tiga Puluh* (Two One Thirty), was founded with the task to raise the funds from the Indonesian population through the sale of stocks. Saadillah Mursjid, then cabinet secretariat minister, was appointed the president director of the DSTP. He described this approach as "being both bold and innovative."[66] Suharto assumed that if every Indonesian citizen participated and purchased DSTP shares, there would be sufficient funds to finish the program. Suharto then traveled around the country urging the people, even farmers in rural areas, to partake in the N2130 funding. Suharto referred to this collective action as *gotongroyong*,[67] an indigenous concept in Indonesian culture, which Geertz translated as a "joint bearing of burdens."[68] In this scheme, the N2130 was seen as a common goal of the nation that deserved genuine support from every single Indonesian; it was a burden the whole population should share.

Figure 6.4 Computer-generated illustration of the N2130 (source: IPTN documentation).

Suharto imagined that someday when the aircraft was completed, Indonesian farmers who contributed to the project would take pride in the airplane.[69] Many critical observers found an irony in this imagination. It was self-evident that a prestigious jet airplane project was unlikely to contribute to the livelihood of the farmers and benefit them. But, for the New Order leader, the N2130 was worth undertaking because its success was expected to bring greater benefits for Indonesia as a whole. Using the bureaucracy network, the New Order government obliged all public servants to purchase DSTP shares in small amounts. Apart from ordinary people and state-owned corporations, Suharto also urged a small group of conglomerates to participate, which amounted to approximately 50 percent of the total DSTP ownership.

Despite criticisms,[70] this capital-intensive effort carried on without substantial obstacles. As the IPTN engineers were focused on developing this project, DSTP placed its primary attention on collecting every dollar for the completion of the program. Once again, the logic of the technological state drove the New Order government to allow technological supremacy take priority over other matters. With the N2130 being developed and the N250 in the certification process, the New Order regime was confident that Indonesia was becoming a high technology powerhouse the world would respect. This was two years before everything went downhill.

7 Downfall

Nations have lost most of the sovereignty they once had, and politicians have lost of their capability to influence events.

Anthony Giddens

If we are flowers, you are the wall. But we have spread our seeds in your wall. One day we grow together with a belief, you will fall apart.

Wiji Tukhul

When 1997 dawned, unfettered optimism preoccupied the New Order leaders. At that point, the future for Indonesia seemed very bright as statistics showed promising indicators of the general condition of the Indonesian economy. Although slightly daunted by a free-trade agreement soon to be implemented in all Association of Southeast Asian Nations (ASEAN) countries, the New Order regime grew in confidence that the country was moving along the right track and prepared to compete in the globalized economy. All New Order technocrats shared this rosy picture; both the engineers and the economists remained certain that their policies worked well to bolster the foundation of Indonesia's economy and industry. Indeed, under Suharto's leadership, Indonesia had maintained steady economic growth at an average of 7 percent per year for over two decades, while the yearly average inflation remained in single digits. As a result of rapid industrialization, the Indonesian economy witnessed a shift from agriculture to manufacturing. The contribution of manufacturing to the national productivity expanded 10 percent in 1997. The GDP per capita had almost quadrupled from US$338 in 1970 to US$1,119 in 1996. With these figures, many analysts and international institutions unequivocally predicted that Indonesia was on its way to becoming one of the next Asian Tigers, following the remarkable success of industrialized East Asian nations. The World Bank, for instance, praised Indonesia in its 1994 report by saying: "[Indonesia's] tradition of sound economic management, the structural reforms of the 1980s, and past investment in human resources and infrastructure have laid the foundation for continued progress in the decades ahead."[1] Greatly impressed by Indonesia's

stunning economic progress over the previous 30 years, Jeffrey Garten (1998) of Yale University included Indonesia in his list of emerging markets that would change the United States and the world.

Indonesia's robust and solid economy was buttressed by strong political stability, which was maintained through disciplinary forces. The New Order successfully suppressed any political uprisings, with ABRI and Golkar functioning as the main pillars of power. Despite the bloody incident in Jakarta caused by internal conflicts within the Indonesian Democratic Party (PDI),[2] the New Order managed to sustain its electoral legitimacy at almost all levels of society after Golkar, once again, won a landslide victory in the 1997 elections. Furthermore, Islam was no longer seen as an ideological threat. Previously perceived as an enemy of the state, Islam became more of a cultural identity than a political inspiration. Through the presence of ICMI the New Order had tamed political Islam and successfully encouraged all major Muslim organizations to acknowledge Pancasila as the sole ideology. What remained uncertain was the leadership succession as the election window was drawing closer. Many wondered whether Suharto would end his sixth term by picking a successor or by seeking another term in the 1998 presidential election. Despite the uncertainty of political regeneration, the New Order was reaching the peak of its authoritarian power.

All cheerful expectations about the future of Indonesia were swiftly washed away when the Asian crisis, an unprecedented wave of financial troubles rippling at a global scale, struck Indonesia and turned what was once considered an East Asian miracle into a nightmare. Within months, the crisis precipitated a series of terrible events that eventually led to Suharto's downfall. This event plummeted Indonesia into a horrible turmoil that changed the country forever. Focusing on the dark episode of the fall of the New Order at the end of twentieth century, this chapter aims to complete the account of the technological state in Indonesia by examining its downfall following the collapse of the New Order authoritarianism. To comprehend the dramatic decline of the technological state, two destructive forces which played pivotal roles in this catastrophe are taken into account. One deals with the impact of globalization steered by neoliberalism; the other pertains to the internal crack within the New Order that caused the rupture of the technological state. These two factors facilitated the abrupt dismantling of Indonesia's high technology programs before the New Order was able to finish implementing the blueprint of high technology-based industrial development as fashioned by Suharto and Habibie.

A contagious crisis

The sheer scale of the Asian financial and monetary crises was unpredictable. It began with a small problem that many observers initially thought to be an isolated event. In May 1997, the value of the Thai baht against US dollar dropped due to speculator assaults. This was perceived as an ordinary incident. The Thai government spent billions of dollars in preserving the value of its currency, a reaction that was supported by intervention from Singapore. Two months later,

the situation worsened. The Thai baht was devalued but only resulted in a 20 percent decline in its initial value. As a result of the widespread panic, Thailand requested assistance from the IMF. A few weeks later, it became apparent that Thailand was not the only economy suffering from the currency emergency; every country in the region was affected by the contagious crisis. When the Korean won dramatically plunged, people began to realize that the ongoing crisis was much larger and deeper than previously assumed. As the crisis was already debilitating South Korea and Thailand, Indonesia began to fear the spread of the crisis to its own shores. However, the New Order government adamantly insisted that such fears were unfounded. Urging people to remain calm, Cabinet Secretary Moerdiono repeatedly announced that Indonesia's economic fundamentals were strong and resilient due to proper financial policies and robust institutions. He mentioned that there was no immediate indication of Indonesia's economy being plunged into financial turbulence.[3]

As it turned out, this confidence was overly optimistic. In a matter of weeks, the financial contagion reached Indonesia. Indonesians were shocked when the exchange rate of the rupiah against the US dollar fell from 2,400 to 3,600 in July 1997. At this point, Indonesians started to feel the shock at home. When the rupiah dropped by 30 percent against the US dollar in August 1997, it not only jolted the New Order government but established the conviction that the crisis was already in effect throughout the country. As the value of the rupiah against the US dollar kept plunging, inflation soared, which in turn caused the prices of daily necessities to rise rapidly. The Suharto administration was in panic as the crisis emerged with such haste. In August 1997, the Indonesian government deliberately allowed the rupiah to float freely with hopes that the currency would regain its strength. The result, however, was the reverse; the rupiah fell further. One month later, knowing that the crisis was far greater than his administration could contain, Suharto decided to solicit financial assistance from the IMF. Responding to Indonesia's request, the IMF agreed to provide a loan package of US$40 billion. But the loan package was not unconditional. On the recommendation of the IMF, in November 1997 the government closed down 16 private banks considered insolvent by the Bank of Indonesia. Rather than stabilizing the situation, this policy immediately lowered confidence about financial institutions, spawning anxiety among local and foreign investors. Record crowds filled several banks due to the fear of closure. The confidence in the rupiah went down even lower by the end of January 1998. The value of the rupiah against the US dollar reached 17,000, partly due to the IMF's reluctance to assist Indonesia in defending the rupiah. This marked the lowest point since the emergence of the crisis and many indications suggested that the rupiah was likely to plummet further, resulting in devastating effects upon Indonesia's economic and industrial sectors.

When all Southeast Asian economies were deeply affected by the crisis, Indonesia fell into more severe problems. What was originally a financial crisis had now turned into a political crisis. The government's inability in preventing the economy from an economic free fall inevitably led to the erosion of Suharto's

legitimacy. Pro-democracy activists seized this opportunity to dethrone the New Order authoritarianism once and for all. After struggling for years, these groups found a momentum in the crisis to tear down Suharto's power along with the institutionalized practices of *korupsi*, *kolusi*, and *nepotisme* (collusion, corruption, and nepotism), popularly referred to as KKN, that deeply plagued the regime. This was manifested through a student movement in Jakarta, which began with action by 20 students from the UI. They came to the parliament building to express their disapproval against the accountability speech Suharto delivered before MPR in March 1998. The message the students sent was clear; they wanted MPR to refuse Suharto another term of presidency. Contrary to the students' demand, Suharto was re-elected by MPR. He proceeded to appoint Habibie as vice president, which seemed unusual given that the position was always occupied by military-affiliated figures.[4] What appeared more controversial amidst the whole criticism on KKN was the composition of the Seventh Development Cabinet, which comprised Suharto's oldest daughter Siti Hardiyanti Rukmana as the Minister of Social Affairs and Muhammad Hasan, a businessman who was very close to the Suharto family, as the Minister of Trade and Industry. It was evident that Suharto was completely oblivious of the fact that the citizenry was increasingly becoming disillusioned by the way Suharto's regime coped with the crisis.

In April 1998, the economy was almost brought down to its knees. Thirty years of the New Order's developmental achievements were swept away by the economic crisis, virtually returning Indonesia to square one. Indonesia's image as a new Asian Tiger vanished overnight. Unhappy that the government failed to acknowledge the seriousness of the crisis, students in Jakarta and other cities showed their displeasure through organizing massive daily protests. For the first time, they explicitly demanded *reformasi*, which meant a change of political regime. They argued that the economic hardships were rooted in the corrupt political system and the only solution to that situation was to replace the New Order authoritarian system with a democratic alternative. On returning from a trip to Egypt, Suharto responded to this demand by saying to the press that the implementation of *reformasi* was not feasible until 2003. The persistence of the New Order strongman to delay the implementation of reform agendas was not the major factor that triggered Suharto's downfall: it was the agreement he signed with IMF in which his government was obliged to withdraw subsidies for fuels. As stated in the 1997 Memorandum of Economic and Financial Policies, "the government intends to adjust administered prices of petroleum products and electricity before the next fiscal year, with a view to *eliminating subsidies* for these products."[5] [emphasis added] This policy was exercised on the grounds that fuel subsidies were a tremendous burden for the government budget, which was strained by the depreciating value of the rupiah. Hence, cutting off fuel subsidies would supposedly relieve the government from greater financial troubles. The abrupt reduction of the respective fuel subsidies aided the government in overcoming an enormous deficit on the state budget. Yet, the political repercussions of this neoliberal-minded policy were much more damaging to the stability

of Suharto's power at that juncture. When fuel subsidies were considerably cut back in early May 1998, inflation instantly soared as fuel prices increased by up to 70 percent. Consequently, the economic conditions grew dreadful and became increasingly uncertain; thousands of people lost their jobs while most business activities ceased to run. Responding to the predicaments resulting from the government's unpopular policy in raising petroleum prices, student activists intensified their protests and coordinated stronger movements around the country against the New Order. Ordinary citizens supported the movements by contributing food and drink supplies to students. By the second week of May 1998, almost all the big cities, such as Jakarta, Bandung, Yogyakarta, Surabaya, Medan, and Makassar, had witnessed large-scale demonstrations organized by students and pro-democracy organizations. *Reformasi* became the people's outcry and echoed throughout the country. On 12 May 1998, a peaceful demonstration turned into a bloody incident when students of Trisakti University in Jakarta marched to the parliament building and were brutally shot on the streets by a battalion of armed security officers. Four Trisakti students were killed and many seriously injured. The Trisakti tragedy sparked off greater unrest. On 13 and 14 May, riots broke out in Jakarta and other cities, accompanied by lootings of shopping centers and offices; dozens of buildings were burned in the process. Hundreds of people were killed during the riots and the Chinese-Indonesian middle class clearly became the primary target of seemingly organized assaults in urban areas. This was the darkest episode during the downfall of the New Order regime. The masterminds of such violent actions remain unknown to date.[6]

In the wake of the May riots, Suharto attempted to return everything to normal. He pledged to immediately implement the reform agendas that the students demanded. However, the political pendulum had swung against him. Legions of students took to the streets calling for a total regime change and put immense pressure on Suharto by occupying the parliament building in Senayan, Jakarta. On 18 May 1998, the Chair of MPR, Harmoko, advised Suharto to relinquish his power for the sake of the country. Suharto remained unmoved by the suggestion and instead planned to form what he called *Komite Reformasi* (Reform Committee). He assumed the committee was effective in affirming his commitment to a political change that would appeal to the students. To Suharto's dismay, nobody supported his plans as the political circumstances had become extremely tense and contentious. Suharto had clearly failed to acknowledge that his circle of power had faltered; some of his trusted acolytes saw no more prospects for the strongman to stay in power. This internal rupture was signaled by the resignations of 14 ministers from the Seventh Development Cabinet on 20 May 1998; the list included Minister of Development Planning Ginandjar Kartasasmita, Minister of Public Housing Akbar Tandjung, and Minister of Energy and Mineral Resources Kuntoro Mangkusubroto. The action these ministers took profoundly disappointed Suharto, who felt betrayed by those he had trusted. Outside of the elite circle, the national situation became even more pressing. Student movements had turned into a people's power calling for Suharto's

removal from power. At that point, Suharto began to realize that his time was over. After having a discussion with a few of his loyal aides, Suharto reluctantly made the decision to step down. On the morning of 21 May 1998, Suharto tendered his resignation on national television, marking the end of his 32-year rule. Under the provisions of the constitution, Habibie took over power and remained in the presidency for 22 months. What lied before him was a lofty task to bring Indonesia to a democratic transition.

Neoliberal attack

What was the root cause of the crisis and how did it crush Indonesia's economic foundations that seemed to be solid and robust prior to the crisis? Why had the New Order technocrats failed to anticipate the onset of the crisis? There is a heated debate among economists and political observers of Indonesia as to why the country fell into a deep crisis and experienced the worst economic turbulences in the region. Some analysts attribute domestic pre-conditions as the crucial factors in explaining the reasons why the Indonesian economy was paralyzed by the crisis. The Suharto government's management of fiscal and monetary balances before the crisis is allegedly a contributing factor.[7] This viewpoint tends to put the blame on the government for its failure to implement prudent fiscal and monetary policies. This would have helped to create more resilient financial structures for the Indonesian economy. While the government lacked the capacity to deal with financial shocks, the private sector also contributed to the fragility of the economy through high risk-taking behaviors.[8] Massive investments in real-estate businesses and the like had driven many large corporations to resort to short-term loans from foreign banks. Such economic behavior increased the reliance of the Indonesian economy on external debts, which eventually debilitated the value of the rupiah against the US dollar. These financial causes, however, were not alone in creating the vulnerable structure, for economic factors were always entangled with political situations. In this view, Suharto's mismanagement of the economy was rooted in the authoritarian nature of his regime plagued by cronyism and nepotism. It is not difficult to find the facts that support this observation. At the end of the New Order regime, Suharto's power had created an economy which enormously benefited Suharto's children and those who had close ties with the Suharto family.[9] The Indonesian economy was generating increasing levels of wealth but it was concentrated among a small group of people. The government's policies were crafted to serve the interests of Suharto's oligarchy, resulting in a fragile economy characterized by a widening economic gap.

This domestic environment, however, only partially explained the onset of the 1997–98 financial crises. Some analysts also pointed to the impact of external forces which pulled Indonesia into an economic black hole during that time.[10] Globalization appeared in this view as the chief contributor to the suffering of Asian economies at the turn of the twenty-first century. It played a role in creating a highly contagious havoc that swiftly spread across the economic networks

in Asia. The global integration of financial and economic systems created a web of interdependency around the world. This meant that any rupture within the networks would affect the whole region. As Indonesia's economy became more integrated into the global structures of finance and trade, it was exposed to greater risks that did not exist before. This was one of the consequences of the late capitalism of the twentieth century, which was characterized by a mechanism of profit accumulation that tapped onto financial systems. In sum, the causes of the Asian crisis that brought down Indonesia's economy, ruining the edifice of the New Order economic achievements, were complex and cannot be explained only by pointing to one single factor. Multiple and interrelated variables contributed to the economic downturn Indonesia experienced from 1997 onwards.

While economists are still debating over which factor was the main cause of the Asian financial crisis, one thing remains clear. Globalization facilitated the pace at which this crisis spread across boundaries. It is a transnational process driven by a belief that globally integrated economies allow the spread of wealth and prosperity across the borderless world. The primary concern of this book on this cause is that globalization not only helped to proliferate the crisis but also opened up the possibility for the globalization force to interfere with Indonesia's political economy and damage the institution of the technological state. The role of the IMF during and after the crisis vividly demonstrated the case in question. As discussed above, the depth of the crisis paved the way for the IMF to get involved in the management of Indonesia's economy. This was not the first time this transnational institution came to provide assistance to Indonesia; throughout the New Order period, the IMF had been a partner of the Suharto administration. Neither was it the first time that the IMF had advised Indonesia to implement a set of market-oriented deregulations; in the mid-1980s, Suharto took IMF advice regarding the restructuring of banking and financial systems. Yet, the IMF intervention in Indonesia's economic management during the 1997–98 crisis was more extensive and forceful. Frustration of the New Order leaders in finding an effective way to cope with the plunging economy provided the IMF with a momentous opportunity to loosen the state's decades-long firm grip over Indonesia's economic structure. Being called in to remedy Indonesia's economic troubles, the IMF administered the neoliberal prescription of "structural adjustments"; it was a formula that sought to reduce or eliminate state interventions in economic affairs and to ensure the full operation of market mechanisms. The signing of the second Letter of Intent (LOI) by Suharto on 15 January 1998 officially marked the triumph of neoliberalism over the state-directed economy in Indonesia. This foray was symbolically displayed in a photograph of a scene where Suharto was bowing over to sign the letter while IMF Managing Director Michael Camdessus stood next to him with crossed arms in an arrogant gesture. Indonesians easily interpreted that moment as the loss of Indonesia's sovereignty to a foreign power. The content of the agreement Suharto signed on that day was more important to note here. The LOI comprised of 50 points that spelled out the intention of the Indonesian government to follow IMF-prescribed

macro-economic reforms as part of the requirements in exchange for the much-needed loans. A few economists criticized the IMF austerity program for Indonesia as it was considered too far, too dramatic, and ineffective.[11] Worth noting in this agreement is how the neoliberal logic of IMF attacked the New Order technological state through the imposition of the LOI. Of 50 points of agreement explicated in the LOI, point 13 explicitly mentioned a policy that would bring an end to the high technology program carried out at IPTN. As written in the LOI: "[The Government of Indonesia] has also decided to discontinue immediately any budgetary and extra-budgetary support and credit privileges granted to IPTN projects."[12] One can allude to the reason behind the decision to cut financial support for IPTN projects.[13] It is clear that state subsidies for large-scale expensive projects such as that of IPTN violated the neoliberal principles that underlie IMF conditional loans. The market fundamentalism that IMF propagated as the core ideology of economic globalization would not permit any state intervention even it was initially meant to support the enhancement of local capacity in technology development. As globalization intensified the spread of neoliberal ideology, it transformed the economic governance of countries desperate for IMF loans to recover from the financial crisis. This is a modus operandi of how globalization forces structurally overturned the technological state in Indonesia in 1998.

The imposition of neoliberal reforms was not the only force behind the abolition of high technology programs in Indonesia. Internal pressure also played a role. As noted in Chapter 3, a disunity of technocracy between the engineer group and the economist group marked the New Order's developmental orientation. For many years, the economic technocrats were in dispute with their engineer colleagues over the huge government expenditure and grants Suharto approved to finance Habibie-led efforts in acquiring advanced technologies. The Asian crisis provided an opportunity for the economists to stop the funding of these programs after Suharto appointed Widjojo Nitisastro to lead a team tasked to stabilize the economy in the wake of the 1997 monetary crisis. The Widjojo group once again came to the fore in rescuing Indonesia's economy from a deep crisis as they did in 1966–68. It was Widjojo and his colleagues[14] who suggested to the IMF to include in the LOI the termination of all financial subsidies granted to IPTN programs, most notably the N250. Pragmatic reasons might have been behind this decision, for the long-term expensive high-tech investments in IPTN were a huge burden for the already-strained state budget. Even Suharto could not have prevented this decision, let alone Habibie and his engineer technocrats. Indeed, Suharto was initially resistant to the plan of cutting financial privileges for IPTN.[15] In the press conference after the signing of the second LOI, Suharto continued to defend the IPTN by emphasizing the strategic function of the aircraft manufacturer to produce small-sized airplanes to meet the transportation needs of connecting Indonesia's numerous islands.[16] However, he was not in a position to make the call as he had lost control over the economy.

Although the withdrawal of government subsidies to IPTN seemed reasonable, it was an unacceptable defeat for technology-minded technocrats and

politicians. ICMI-affiliated economists thought it was unfair because the IPTN programs did not weaken the economy, and did not cause the crisis. They agreed the funding for IPTN programs was massive compared to other government projects but they insisted that the blame should not be placed on IPTN because it was a strategic industry and the work was in the national interest.[17] It was different in purpose, for instance, from the National Car project controlled by Hutomo Mandala Putra, which was also terminated by the LOI. The latter only catered to personal gains for Suharto's son, while the IPTN programs were meant to enhance the national capacity in high technology. What outraged pro-high-tech development groups even more was the decision by the IMF to allow the Bank of Indonesia to provide a bailout of IDR144 trillion—about 14 percent of GDP—to rescue mostly private banks.[18] The astronomical amount of this bailout package, known as BLBI (Liquidity Supports of the Bank of Indonesia), was far above government expenditure on IPTN programs. BLBI was seen as subsidies granted to the private sector. For the engineer technocrats, this was a blatant double standard in the IMF's conditions for the rescue and recovery package. Rahardi Ramelan was convinced such double standards were intentional. He believed that Western airplane makers pushed for the cuts in IPTN programs. He argued that the success of IPTN in developing the N250, which was to be marketed in North America and Europe, had worried aircraft industry giants such as Boeing and Airbus. The fact that many of the IMF policies imposed on developing countries profited mostly global corporations of Western nations reaffirmed Ramelan's conviction that the neoliberal attack on IPTN was mainly to serve the interests of Western industries.[19] A religious interpretation came from ICMI exponent Dawam Rahardjo. In his view, the cancellation of IPTN projects was a subtle yet systematic attempt by Western powers against the achievement of Muslim countries such as Indonesia in developing high technology.[20] Many pro-Habibie economists and Muslim groups shared this conspiracy-theory explanation although the accusation remains unproven. Nevertheless, the political and economic liberalization after the demise of the New Order regime wreaked havoc on the Indonesian technological state. Over four years, the abrupt withdrawal of state subsidies to IPTN affected all programs of high technology the Habibie team had planned and organized for 20 years. Thanks to the globalization force that brought in the crisis and the neoliberal recipe, the crack within the New Order technocracy splitting the engineers and the economists eventually led to the dramatic deformation of the technological state. This continued to unfold in the post-Suharto period.

Post-Suharto politics

The transfer of power from Suharto to Habibie did not necessarily defuse the political instability which had overwhelmed Indonesia since the May riots. Most of the anti-Suharto groups perceived the Habibie government merely as a continuation of the New Order regime. "Suharto may have stepped down, but his regime remains in power" was a conviction many students and pro-democracy

activists widely shared. Hence, they demanded Habibie be replaced by a presidium appointed to handle the transition process.[21] Being Suharto's closest technocrat and politician, Habibie inevitably faced a lack of legitimacy among the general public. At the same time, he had to convince the military elite that he possessed the required capacity to lead the country through the financial crisis and oversee uneasy democratic transitions; in fact some elements in the Army, according to Habibie, had planned to take over power from him.[22] Faced with the precarious situation where threats to his power were coming from multiple directions, Habibie focused his leadership fully on establishing institutional infrastructures necessary to install a genuine democracy in Indonesia.[23] Within less than two years, Habibie and his cabinet crafted a great number of new laws while abolishing Suharto-inherited laws that were no longer suitable for the newly democratic environment. In retrospect, the Habibie administration laid out the foundation of a liberal democracy which currently governs Indonesian politics; one that is based on a multi-party system with a strong parliament institution accompanied by the presence of free press. Many of Habibie's policies appeared surprising and even controversial. For instance, he began the short period of his presidency by freeing political prisoners who had been jailed due to their critical stance against Suharto, including the celebrated Indonesian novelist Pramoedya Ananta Toer. He also reinstated the publication of *Tempo*, *Detik*, and *Editor*, three national magazines that had had their licenses cancelled by the Suharto regime because of their reports about Habibie (see Chapter 2). One of the most controversial decisions made by Habibie was his approval to hold a memorandum for East Timor that led to the separation of this region from Indonesia.[24] A few analysts applauded his decision to grant a memorandum to East Timor because it relieved Indonesia from long-term international pressure. Yet, this move cost Habibie the possibility of extending his term after a majority of the newly-elected parliament members rejected his accountability speech in October 1999 on the grounds that Habibie had failed to preserve the integrity of Indonesia's territory.

One may think that as the president of the republic, Habibie would have the chance to save the technological state from demise. However, this would have been an optimistic expectation. The contentious politics Habibie was compelled to cope with in a short period of time had diverted all his attention, efforts, and time to politics, economic stabilization, and the building of democratic institutions. In any case, the Habibie administration was bound to the agreements with the IMF that disallowed the government to channel financial support to high-tech projects. Although the Habibie cabinet was largely filled by engineer technocrats, technology was not listed as a top priority in the government's immediate agendas. Such constraints had cascading effects on the technological state, particularly when the Habibie group was no longer in power.

In October 1999, Abdurrahman Wahid, a moderate Muslim leader who chaired Indonesia's largest Islamic organization *Nahdlatul Ulama*, was elected by the MPR as the fourth president of Indonesia while Megawati Sukarnoputri, chair of the Indonesia Democratic Party of Struggle (PDIP), which had won the

1999 parliamentary elections, became the vice president. The new government did not seem interested in continuing what the New Order had accomplished in high technology advancements. On the contrary, there was a strong sentiment against the high technology program. A few factions in the newly formed parliament, most notably the PDIP, considered the institution of the technological state as a legacy of Suharto that ought to be abolished. This view had a real impact on IPTN after Wahid and Megawati came to power. The withdrawal of state funding caused all the ongoing projects of IPTN to encounter difficulties. IPTN had had to deal with enormous financial problems, including debts and unpaid salaries. The US$2 billion N2130 jet airplane project under the supervision of Ilham Habibie was eventually terminated after the new government closed down the financing company, DSTP. The discontinued finance also had an impact on the N250 program. This symbol of Indonesia's technological grandeur stagnated in its third prototype production. Even though the second prototype of the N250 successfully made a flight in February 1996, it failed to earn an FAA airworthiness certificate due to poor documentation. This technological product, which had carried great national ambitions, never had the chance to reach the market as planned.

The worst was yet to come to IPTN. In September 2000, President Abdurahman Wahid renamed the IPTN the Indonesian Aerospace (IAe or PTDI in Indonesian). New management, directed by IPTN senior engineer Yusman S. Djamal, was appointed to take care of the high-tech company, which now inherited a total debt of US$3 billion.[25] Faced with this pressure, the new management strenuously struggled to keep the aircraft industry alive by harnessing all the resources it had. So desperate was the situation that Djamal took an order from a local manufacturer to make a cast for cooking pans. However, this did not last long. Habibie called Djamal and asked him to terminate the kitchenware project. "It was embarrassing, a blot on the hi-tech image of IPTN," Habibie angrily said to Djamal.[26] A conflict between the Djamal management and Minister of State-owned Enterprises Laksamana Sukardi later led to a new PTDI management team in August 2002. This time, Djamal's junior Edwin Soedarmo was put in charge. But the new leadership did not help to improve PTDI's performance. Uncertain conditions led to the resignations of large numbers of IPTN qualified engineers, who left the company to seek better jobs elsewhere. This brain drain led to many former IPTN engineers working for aircraft industries in North America and Europe. The situation was further strained when the PTDI labor union (SP-FKK) went on strike for higher wages, resulting in rising tensions with the management. But this was not the climax. In July 2003, Soedarmo laid off thousands of employees in order to save PTDI from bankruptcy. Unhappy with the way the management solved the problem, SP-FKK members rallied angrily in the streets to protest the management's policy. This unrest instantly attracted national attention in the newspapers and on television. Fearful of violent actions, the management eventually decided to call in the Air Force to secure the company's properties. PTDI was shut down for a month. It was an event that marked the worst crisis in the history of this once prestigious

company. Although PTDI continues to run to date, the scope of its operation and the size of its workforce have been substantially scaled back and its R&D is no longer prominent.

Other institutions of the New Order technological state followed the same decline. BPIS, for instance, failed to survive the regime change. In August 1998, the Habibie administration converted the status of BPIS from a state agency into a state-owned company named Pakarya Industri. One year later, it was renamed Bahana Pakarya Industri Strategis, carrying the same acronym BPIS; it served as a holding company for the state-owned strategic industries. In July 2001, Megawati became president after Wahid was impeached by the parliament. In September 2002, Megawati signed a decree to terminate BPIS permanently.[27] This decree ended the history of state-coordinated strategic industries management in Indonesia. It is interesting to note that the decision to shut down BPIS was evidently driven by anti-Suharto sentiment in the parliament, particularly from the members of Megawati's PDIP.[28] For these groups, BPIS was seen as a representation and a reminder of the authoritarian style of the New Order leadership that had to be eliminated.

Although it survived, BPPT lost a significant amount of influence and vitality within a short time. After the end of the Habibie government, BPPT lost its power and authority on policymaking in many strategic sectors. What was once the stronghold of the engineer technocrats and the core of the technological state is now an ordinary government agency with decreased resources and access to power. The separation of the BPPT chair and Minister of Research and Technology in 2006 further weakened this institution. Likewise, the RISTEK is not as powerful as it used to be. Since the Wahid administration, the position of Minister of Research and Technology has been granted to a politician instead of being filled by a person with competency and reputation in science and engineering.[29] All of these trends indicate the tragic decline of the technological state in Indonesia as the country now ventures into globalization with a more liberalized structure of political economy.

Epilogue

What does it mean to say that technology is politically constructed? Existing STS literature has offered empirically grounded accounts of the ways in which political interests, causes, motives, and goals shape development, dissemination, and utilization of technology across societies.[1] A common underlying argument of these works is that the construction of technological systems and artifacts is not completely governed by a pure technical rationality. In other words, the process of technological development is not entirely dominated by considerations of physical calculations and material constraints. What appears significant, according to the study of technological politics, is that external forces that spring from the political realm play a prominent role in structuring the shape and form of technology. In this perspective, technology is seen to embody power of those who have access to the inception of technology. Political biases are thus mediated by technical features, arrangements, and configurations that are particularly designed by technical experts to accomplish a political end; and every design is meant "to enhance the power, authority, and privilege of some over others" (Winner 1986: 25). These thoughts suggest that technology and politics are mutually reinforcing in the production of power. On one hand, the material configurations of technology have political effects and are effective in use for political purposes. On the other hand, the shaping of technology is greatly influenced by the context of power relations which operate in the space where the technology exists. To a few scholars who are interested in the question of socio-technological transformations, the interplay between technology and politics that ubiquitously characterize modern society today is best described by the notion of co-production, a particular STS view that puts forward the proposition that "knowledge and its material embodiments are at once product of social work and constitutive of forms of social life" (Jasanoff 2004: 2). This entails that an inquiry into technological progress requires an examination into the operation of political power and at the same time seeks to uncover far-reaching implications that concerted technological enterprises have on the political milieus.

The concept of the technological state that has been presented throughout this book is precisely situated in a discourse that probes the interplay between politics and technology as STS scholars have illustrated in a myriad of vignettes. Examining Indonesia's experience of development during the New Order period,

this book posits that the technological state was an outcome of the complex interconnections between the structure of authoritarian politics and the institutionalized ambition of high technology development. Yet, the account of the technological state in this book is rather distinctive from the study of technological politics as compared to those commonly found in existing STS works. This book has revealed how technology and politics were inextricably intertwined in the formation of the New Order technological state by examining technological politics from a broader scope. Rather than merely focus on how technical arrangements and political dimensions are dovetailed, this book has described the technological state in a more complex picture that encompasses multiple layers of interaction and interconnection. A summary of these layers is necessary for us to comprehend the nature and structure of the technological state which the New Order regime had built for over two decades. In the following paragraphs I will discuss each of these layers in a hierarchical order.

At the top of the layers is the ideological, which constitutes the whole vision of socio-economic transformations to be materialized through high technology production. Chapter 1 described the ideology of the New Order developmental regime and explained where this ideology is rooted. For a long period of time, the New Order exhibited authoritarian characteristics. The main ideological element in the New Order is constituted by the term "New Order," which refers to a new arrangement of socio-political institutions whereby power is concentrated in the hands of the state. The reason for the establishment of such an order lies in the objective of the regime: to create a society founded upon modern imaginations. More specifically, the idea of modern society follows Western history of social progress, which revolves around capitalism and the industrial economy. Thus, the New Order is essentially a concept that served as a platform for social changes in which the state sought to build a set of institutions to facilitate capitalist production systems. A fundamental component in the establishment of these institutions was the extensive utilization of disciplinary practices which the New Order state implemented. These disciplinary practices included a variety of violent methods not only to suppress dissenting voices but more importantly to produce collective behaviors of docility in society at all levels. What needs to be highlighted in scrutinizing the ideological foundation of the New Order technological state is that its authoritarian power did not emanate solely from its capacity for violence. It was also drawn from the belief in modern progress which was entangled with the obsession for technological supremacy that became the basis of legitimacy for the regime. This resulted in massive efforts to transform the violent imagery of the state into a modern one in which industrial progress and high technology advancement aided in vindicating state-led violent and forceful oppression upon society.

The developmental ideology requires an epistemology to materialize its vision. This is another layer to explicate in understanding the operation of the technological state. Epistemology here refers to a repertoire of scientific knowledge that informs how developmental changes are planned, managed, and achieved. In the New Order technological state, the process of

socio-technological transformations and progress was formulated, materialized, and overseen by a specific form of knowledge, namely *technocratic knowledge*. This form of knowledge was extremely pivotal because it provided strategies and techniques to materialize the New Order's ambitions. As a result, the ideological foundation of the New Order gave rise to technocratic rule, which influenced a considerable proportion of the political economic structure and its trajectory. This rendered the New Order, as I have argued in this book, more of a technocratic than a military regime. While the New Order politics was heavily swayed by the striking presence of military politics, it was technocracy that established the goal and directed the course of developmental change the regime aimed to pursue. The supremacy of the technocrats in the political economy of the New Order development exhibited the power effects of developmental ideology upon the technocratic system. As noted throughout this book, the New Order technocracy was not monolithic; it was strikingly marked by a competition between two groups of technocrats, namely the engineers and the economists. Each of these groups brought in different technocratic epistemology that affected Indonesian development management at the national level. Both groups stressed the importance of rapid industrialization as being the most effective approach to achieve high economic growth. In addition, the engineers and the economists shared the belief that the state should play a central role in development management, although the latter sought to align the role of the state with the functioning of markets. A distinction between these two epistemologies lies in the way the engineers formulated a developmental strategy that places a strong emphasis on high technology as the main driving force in accelerating socio-economic transformations for Indonesia. Furthermore, the engineers' technocratic epistemology subscribes to a nationalistic aspiration where technological supremacy, rather than capital accumulation per se, was the chief objective the New Order ought to accomplish. Consequently, it rendered a shift of developmental trajectory from the model of developmental state to that of technological state, which has been explained in this book.

While epistemology is necessary to provide strategies, methods, and techniques to pursue the ideological goals, it requires a host of institutions with the capacity to translate them into desired outcomes. During the industrialization of East Asian countries, most of the production of technology involved intensive participation of private enterprises under the auspice of the state. In the New Order Indonesia, the role of the state was strikingly prominent in this process. This was due to the unique relationships culminated between the state and private sectors, which did not encourage private corporations to enhance capacities in research and development through effective incentive schemes. The developmental orientation of the engineer technocrats led to R&D being carried out by and incorporated into state organizations. With RISTEK as the central coordinating institution at the ministerial level, upgrading state capacity to carry out cutting-edge technological research and to yield advanced technologies constituted the primary objective of establishing the arrays of technological institutions underwritten by state budgets.

This book has also presented a detailed account of how the production of high technology was institutionalized within the state structure, resulting in an idiosyncratic model of institution. In this account, two state organizations were described as the quintessential players that underpinned the institutional building of the New Order technological state. One was concentrated on research activities, whereas the other aimed to transform research outputs into industrial products. Following the notion of bureaucracy as the core of state institution, this book elucidated the bureaucratization of technology concentrated in the central government, which functioned to conduct and manage research programs from a broad range of technological fields. The process of bureaucratization of technology was primarily centered on BPPT, a super agency that was deliberately constructed to hold an unmatchable span of authority to formulate policies and to get involved in nearly all government-funded projects. A close partner of BPPT was BPIS, a special agency that was meant to accelerate high technology production by directing and coordinating a pool of state-owned strategic industries. Indeed, there were more research-related institutions operated by the government. However, it was BPPT and BPIS that constituted the core of the New Order technological state which became the nexus of activities, programs, and policymaking. This enabled the Habibie group to implement the vision of high technology development that embodied the formation of a technological state.

The above processes eventually boiled down to technical products that proved the state's capacity to produce advanced technologies. In fact, the accomplishment of such material outcomes was one of the defining features in the formation of the technological state, for it indicates the success of the state in realizing its goal of socio-technological progress. There was a cornucopia of technological innovations and advancements the New Order technological state had yielded, which were the outputs of a host of state-directed strategic industries. Although these innovations were analytically crucial, no high technology programs organized by the New Order were more prominent than the aircraft industry in Bandung. As discussed in this book, IPTN was the flagship of Indonesia's venture into high technology enterprises. It constituted the heartbeat of the technological state where extremely costly, high-profiled projects were carried out by the state to improve its technological prowess, which reinforced its legitimacy. Examining IPTN closely, as this book has done, provides a close-up picture of a complex organization in which the developing state managed to acquire high technology in an attempt to ensure the hastening of socio-technical breakthroughs. This resulted in the manifestation of a superior technical product, the N250, which took massive effort by the state not only in financing the program but also in developing human resources, organizational skills, and technical competence. As repeatedly emphasized by the New Order elite, the N250 was remarkably significant because it was indigenously designed and locally manufactured by Indonesian engineers and technicians. This is of great importance because it served as a testimony of the technological supremacy the New Order sought to accomplish; it is no surprise that it was nationally celebrated as the highest achievement in the history of Indonesian technology. Despite

controversies over the financing and funding of the N250 project, it showcased IPTN's technical skills and knowledge. It also demonstrated the increased capabilities of IPTN as a state-owned industry in developing large-scale technological innovations. Relevant to highlight in this aspect is the innovation of the fly-by-wire flight control system, which was presented as a distinctive feature of the airplane, rendering the N250 the most advanced of the kind. The creation of fly-by-wire exhibits an extended reach of the state down to a micro-level process in the construction of technical systems. It illustrates how choices of technical configurations were made top-down and responded bottom-up. It confirms that material outcomes were a product of state power and authority mediated by a hierarchy of technological organization clinging to the state structure.

Finally, we examined the last but equally important layer of the technological state, namely the symbolic. As argued in this book, the formation of the technological state in the New Order regime was driven by a great interest in achieving technological supremacy that would reinforce the legitimacy of the New Order. All of the successes in developing and constructing indigenously designed technologies do not suffice to achieve the political end without a production of meanings attached to the material embodiment of high technology development. The material requires a "soul" to resonate with national culture and politics, without which technology would lose its social and political relevance. Hence, the material must be entangled with the symbolic in order to produce desirable effects of power for the state to exploit. The presentation of the N250 *Gatotkaca* in such an elaborate performance exemplifies the efficacy of symbolic registers, such as the use of mythology and particular visual schemes, to arouse nationalistic feelings and sentiments that bolstered state power. It cast an image of a new modern state that vindicated the history of violence of the New Order authoritarianism. Thus, one should not trivialize the symbolic because it embodies the meaning of supremacy itself and delivers such a meaning to those who encounter the magnificent artifact of the N250 as an intellectual product of the state. The symbolic also provides an avenue for the technological state to accomplish its political goal through the inception of an impressive and powerful technical artifact effective in cultivating public support. And it is through this avenue where technology and politics are fully integrated.

Those five layers created an intricate web of relationships which underpinned the formation and consolidation of the technological state in Indonesia for two decades. Each layer contributed to the politics of technology in the New Order period. One of the distinguishing features of this politics of technology is that the political economy is completely structured and organized around the interaction between state bureaucracy, a strong practice of technocracy and micro-level power relations at the individual level, most notably between Suharto and his most trusted aide, B.J. Habibie. The impact of this political economy on Indonesian development was remarkable as it created a grand shift in the trajectory of a developmental state to a technological state. The shift became more apparent by the end of 1980s up to the mid-1990s, during which time the New Order government relentlessly provided tremendous amounts of financial, institutional, and

political support to materialize the high technology vision formulated by the Habibie group. At the end of its reign, the technological state was readily prepared for a global expansion, a move that was primarily seen in the globalization of IPTN products in North America and Europe. Apart from obvious economic interests, another factor which pushed the New Order to extend the base of its high-tech industry abroad was the effects on domestic politics. The ability to penetrate into foreign markets, especially in developed nations, helped to enhance Indonesia's national pride and self-esteem in the New Order's high technology enterprises.

Globalization, however, challenges the authority and sovereignty of nation-states. In the New Order politics of technology, global forces played a pivotal role in the deformation of the technological state. Paradoxically, while globalization was seen as a process that brought opportunities for Indonesia to expand the production of advanced technologies overseas, it also unexpectedly and indirectly brought about the merciless financial crisis to destroy the edifice of the technological state. The neoliberal attack on Indonesia's technological state, it should be noted, originated from the structure of political economy beyond the boundaries controlled by the New Order. The integration of Indonesian economy to the globalized network had the consequences of eclipsing the ability of the technological state to withstand external disruptions.

How should we explain the fiasco of the technological state in Indonesia in the aftermath of the 1997–98 crises? Observers who subscribe to market-oriented economic analysis are inclined to locate the reason why Habibie-led high-tech programs declined in the economic performances of the programs. They referred to the low profitability of the strategic industries (i.e., the aircraft industry) as the main factor that caused the downfall of the technological state upon the onset of the crisis. This perspective portrays how the capital-intensive high technology projects were reasonably terminated because they did not conform to the logic of the markets. Such an explanation may have a grain of truth. However, as recounted in this book, the political circumstances appeared more prevalent in causing the technological state to abruptly decline. Apart from the neoliberal force that interfered with Indonesia's economic management, the crack within the New Order technocracy also contributed to the cascade of the technological state. A long-standing disagreement in developmental orientation between the economists and the engineers led to the breakdown of the technological state after the New Order regime began to lose its grip on the economy.

I have argued that the New Order's strong desire for technological supremacy was aimed at strengthening its legitimacy. However, one may question why the New Order still collapsed even though it was able to accomplish its goal in producing high technology. Why was there a weakening of the legitimacy it sought to cultivate from high technology advancements? Indeed, this is the paradox of the technological state in Indonesia. The technological state aided the New Order regime in fermenting dissenting voices and oppositions to embrace the high technology visions of both Suharto and Habibie. However, when the power structure of the New Order was in disarray due to the economic crisis and

political turmoil, it had far-reaching effects on the stability of the technological state. This indicates the failure of the technological state to aid the New Order in keeping its legitimacy from domestic challenges because it was itself deeply embedded in the regime's authoritarian power. When such sources of power diminished, the foundation of the technological state was also shaken. Consequently, it followed the collapse of the authoritarian regime that nurtured the system. This is an inevitable consequence when authoritarian politics is constitutive of high technology development. What remains to be seen is whether the technological state will re-emerge in Indonesia's current environment, which is characterized by democratic politics and a more liberalized economy.

Notes

Introduction

1 "Fasten your seat belts: a top Minister gambles on a smooth Flight," *Asiaweek*, 11 August 1995.
2 Quoted in Escobar (1995), p. 3.
3 This model was first introduced by Rostow (1964) and enjoyed popularity during 1960s and 1970s in Southeast Asia.
4 For literature on technology transfer studies, see Reddy (1996) and Cohen (2004).
5 See an edited volume by MacKenzie and Wajcman (2002).
6 See a collection of essays on these issues in Bijker and Law (1992).
7 Sheila Jasanoff introduces this concept as a response to the conflict between those who emphasize social determinism and those who argue for scientific determinism.
8 See Jessop (2008) for an approach to studying state power.
9 See Weber (1968).
10 This sort of criticism typically comes from a neoliberal position that generally assumes state interventions to cause contradictions in industrial development. See Hayashi (2010).
11 See a collection of essays on the developmental state by Woo-Cumings (1999).
12 This is emphasized in Evans (1995).
13 A collection of essays on this discourse is edited by Steinmetz (1999).
14 See Johnson (1982), p. 24.
15 For a complete account of the Indonesian economy, see Hill (2000).
16 For a good analysis of these structures, see Vatikiotis (1993).
17 Liddle (1991) stressed this point.
18 See a collection of essays edited by Anderson (2002).

1 Authoritarianism and technocracy

1 The name of Suharto is also spelled as "Soeharto," following the old spelling system of the Indonesian language. For the sake of consistency, this book uses "Suharto," which refers to the perfected spelling system (Ejaan Yang Disempurnakan).
2 An oft-cited work on this issue is Hamish McDonald (1981).
3 See Anderson and McVey (1971).
4 In his biography, Suharto revealed his suspicion although it was never accurately proven. See Suharto (1989), p. 119.
5 A publication of the military's version of the G30S movement is produced by historian Nugroho Notosusanto (1966).
6 The US involvement in this tragedy is examined in W. Blum (2003).
7 A complete account on the 1965–66 massacre is published in Cribb (1990). For a recent study on this topic, see Roosa (2006).

8 See an edited volume by Anderson (2001).
9 This term was popularized by an article by Ransom (1970). In fact, Ransom did not coin the term "Berkeley Mafia." He heard this term used by high-level bureaucrats in Jakarta. An anecdote has it that the term might originate from Widjojo and his fellow economists at BAPPENAS as a sort of joke among themselves.
10 The history of this program is recounted in Bresnan (2006).
11 For the influence of American interests on the Indonesia developmental model, see Simpson (2010).
12 An examination of ABRI's doctrines is given in Sebastian (2006).
13 See the history of dwifungsi in Said (2006).
14 Crouch (1979) analyzed the political effects of the military structures.
15 For a comprehensive analysis of the structure of the New Order power, see Vatikiotis (1993).
16 Suharto stressed this point in his official address as Acting President before the Ampera Cabinet on 19 April 1967.
17 When the movie was first launched in 1984, the New Order government urged students around the country to watch it at theatres. Commencing in the following year, *Pengkhianatan* was screened on national television on 30 September every year. This lasted for 14 years. It is very likely that every adult person in Indonesia today has seen this horrifying movie at least once in lifetime.
18 One scene in the movie depicted an explicit scene of how a female member of the PKI used a shaving blade to slash the face of one of the abducted generals.
19 This story is accounted in Suharto's autobiography. See also Elson (2001).
20 A long-term study of Indonesian economy is presented in Hill (2000).
21 See Nitisastro (2010), pp. 128–9.
22 Interview with Emil Salim, Jakarta, 17 December 2010.
23 These problems were pointed out by a group of economists that takes a different view from the Widjojo group. Most of them criticized the market economy model Widjojo and his fellows implemented.
24 This problem was pointed out in Rachbini (1995a).
25 See for example Chua (2008) and Suryadinata (1995).
26 See Rachbini (1995b).
27 See also Hira (1998).
28 Interview with Emil Salim, Jakarta, 17 December 2010.
29 Nitisastro (2010) pp. 86–7.
30 See E. Salim, "Kata Sambutan" in Nitisastro (2010), p. xvi.
31 See Moertopo (1973).
32 For a critical examination on technological determinism, see Smith and Marx (1994).
33 Interview with Emil Salim, Jakarta, 17 December 2010.
34 Moertopo (1973), p. 81.
35 Suharto (1989), p. 452.

2 The general and the engineer

1 For a recent and comprehensive account on Suharto's political biography, see Elson (2001).
2 Priyayi was a native elite class created by the Dutch during the colonial period to serve colonial bureaucratic and industrial interests.
3 See Makka (1996a), p. 42.
4 Interview with S. Paramajuda, Jakarta, 2 July 2004.
5 Interview with B.J. Habibie, New York, 6 July 2005.
6 Makka (1996a), p. 80.
7 Interview with Oetaryo Diran, Jakarta, 28 July 2004.
8 Makka (1996a), p. 42.

9 The story about this group is accounted in Simanjuntak (1988).
10 Suharto (1989), p. 78.
11 See Moon (2010).
12 Ibnu Sutowo recounted his first meeting with Habibie in his testimony "Mangayubagyo 60 Tahun B.J. Habibie," in Makka (1996b), pp. 61–4.
13 Makka (1996a), p. 148.
14 Ibid., p. 134.
15 For an elaborate analysis of Bourdieu's notion of capital, see Swartz (1997).
16 Suharto (1989), p. 453.
17 Ibid., p. 282.
18 "Jerman punya kapal, Indonesia punya beban," *Tempo*, 4 June 1994.
19 "Habibie dan kapal itu," *Tempo.* 11 June 1994.
20 Makka (1996a), pp. 237–38.
21 Ibid., pp. 238–9.
22 The Muslim community in Indonesia can largely be divided into traditionalists and modernists. The former, mostly under the banner of Nahdlatul Ulama (NU), follow the Syafi'i school taught by charismatic *ulama* (Muslim priests) in many rural-based Islamic schools called *pesantren*. The latter is influenced by nineteenth century Middle Eastern thought, e.g., Muhammad Abduh and Rahid Hida. The modernists reject Syafi'i and other schools, and refer directly to Qur'an and hadith. Geographically, most traditionalists are concentrated in the rural areas of Javanese island, while the modernist community grows in urban areas in Sumatra, Java, and Sulawesi. The different teaching sources shape the political behaviors of these Muslim groups. While the traditionalists are inclined to be passive in politics, the modernists view politics as a venue to defend the interests of the Muslim community. Hence, the modernists are very active in advocating the political rights of the Muslims and in shaping the agenda of political Islam. See Liddle (2003).
23 For a complete account of political Islam during the New Order period, see Effendy (2004).
24 Nurcholis Madjid promoted his concept of Indonesian Islam in Madjid (1987).
25 See Makka (1996a), pp. 589–98.
26 The role of Abdurahim is discussed in Asshiddiqie *et al.* (2002).
27 Abdurahman Wahid was chair of traditionalist camp NU. Soon after ICMI was formed, Wahid founded Democracy Forum (Fordem) as a response to the influence of ICMI in politics.
28 See Schwarz (1994), p. 176.
29 Hefner (2000), p. 135.
30 Makka (1996a), p. 598.
31 Ibid., p. 286.
32 See an op-ed piece by Amien Rais "Ini keajaiban," *Republika*, 15 August 1995.
33 See Amir (2009).

3 Bureaucratization of technology

1 See D. Rueschemeyer and P. Evans, "The state and economic transformation: toward an analysis of the conditions underlying effective interventions," in Evans, Rueschemeyer, and Skocpol (1985).
2 See Hecht (2009), p. 56.
3 See Makka (2008), pp. 87–8.
4 See Sutowo (2008), pp. 24–5.
5 Interview with Rahardi Ramelan, Jakarta, 27 June 2011.
6 An account of this group of engineers is completely presented in Simanjuntak (1988).
7 See Shiraishi (1996).
8 Interview with Rahardi Ramelan, Jakarta 27 June 2011.

9 Interview with Sudradjat Djiwandono, Singapore, 10 February 2010.
10 For a full account of this affair, see McDonald (1981).
11 Interview with Saswinadi Sasmodjo, Bandung, 12 July 2003.
12 Interview with Filino Harahap, Bandung, 6 August 2003.
13 See Barker (2005).
14 Interview with Iskandar Alisyahbana, 21 July 2003. According to Filino Harahap, a few ITB professors disagreed with Alisyahbana's idea to confer a professorship on Habibie.
15 Suharto (1989), p. 452.
16 Ibid., p. 453.
17 Ibid., p. 280.
18 The Address of President Suharto on 28 September 1978.
19 Ibid.
20 See Bishry and Hidayat (1998).
21 The authority of BPPT is examined in Raillon (1990), pp. 65–70.
22 The role of BPPT in Batam is accounted in Aritenang (2004).
23 Among the works is Peachey, Perry and Grundy-Warr (1997).
24 See Amir (2010).
25 Although the New Order government provided ample resources for the production of nuclear power, it never materialized due to political and economic reasons. See Amir (2010).
26 Interview with Dewi Odjar, Jakarta, 8 July 2011.
27 Notwithstanding the prestige of BPPT, a vast majority of BPPT qualified researchers were poorly paid compared to those working for private corporations. Consequently, they often moonlighted as engineering consultants for private businesses. This inevitably affected the productivity of BPPT.
28 Taken from Djojonegoro (1990).
29 Interview with Emil Salim, Jakarta, 24 December 2010.
30 Interview with Sudrajat Juwandono, Singapore, 10 February 2010.
31 See Sutowo (2008). pp. 251–2.
32 See "The politics of making policy" in Schwarz (1994).
33 Inspired by an American way of naming a concept of economics after a leader's name such as *Reagonomics* or *Clintonomics*.
34 See an op-ed article by Kwik Kian Gie "Konsep pembangunan ekonomi Professor Habibie," *Kompas*, 4 March 1993.
35 Sri Bintang Pamungkas coined this term to criticize the economists' liberalist approach in his article "Widjojonomics: perkembangan dan dampak ekonominya," *Media Indonesia*, 6 April 1993.
36 "BJ Habibie: Widijojonomics dan Habibienomics itu tidak ada," *Kompas*, 24 April 1993.
37 See an article by U. Juoro "Teknolog, teknokrat, dan strategi pembangunan," *Kompas*, 22 March 1996.
38 See the classic work of Ricardo, *On the principles of political economy and taxation*, published in 1817.
39 This is emphasized in U. Juoro "Membangun Daya Saing Nasional," *Kompas*, 6 February 1996.
40 See Rahardjo (1997) and Juoro (1998).
41 Juoro (1998).
42 Habibie (1995), p. 90.
43 This criticism is discussed in Thee Kian Wie "Teknokrat, teknolog, dan kebijaksanaan industri," *Kompas*, 28 February 1996, and "Kebijaksanaan industri dan teknologi," *Kompas*, 5 September 1996.
44 See an article by Sri Edi Swasosno, "Habibienomics, Widjojonomics, dan Pancasilanomics," *Suara Pembaruan*, 20 April 1993.

45 Parts of these critiques are presented in Rice (1998), pp. 185–98.
46 See an article by Thee Kian Wie, "Kebijakan industri dan teknologi," *Kompas*, 5 September 1996.
47 In the new growth theory, technology is seen as an endogenous factor. See for example Solow (2000).
48 See Juoro (1998).
49 For the dynamics of political economy during this period, see Mallarangeng (2000).
50 Among strong critiques of the New Order policy on foreign debt is Rachbini (1995a).
51 See for example Mubyarto (1995); and Swasono (1990).
52 These sentiments were strongly voiced by the activists group in ICMI. Interview with Adi Sasono, Jakarta, 11 July 2004.
53 Mari'e Muhammad was a long-serving official at the Department of Finance and not directly linked to the economists. However, he had stronger relations with Widjojo than with Habibie.
54 The appointment of Haryanto Dhanutirto and Wardiman Djojonegoro sparked a controversy due to their competence. Dhanutirto was a pharmacy professor at ITB and had no prior experience in transportation sectors. As such, he was often blamed for many transportation accidents during his assignment. Likewise, Djojonegoro, who obtained a degree in transportation engineering, more suitable to Dhanutirto's post, was given the task to tackle education and culture.
55 Satryo Budiharjo Joedono was a professor of the Faculty of Economics at UI. However, during his bureaucratic tenure he became closer to Habibie's camp than Widjojo's.
56 Ginandjar Kartasasmita studied at ITB for one year before heading to Tokyo, completing a degree in chemical engineering in 1965. He joined the Indonesia Air Force before progressing his bureaucratic career. Prior to his post at BAPPENAS, Kartasasmita served as a junior minister assigned to enhance the use of locally manufactured products.
57 See Kartasasmita (1994), p. 64.

4 Building strategic industries

1 This view is expressed in several publications by engineering-minded observers, for example Muhammad (1992).
2 A study on technological capacities of private sectors was conducted by Thee (1997).
3 See Suharto (1989), pp. 280–2.
4 See Sampurno-Kuffal (2011).
5 Interview with Giri Suseno Hadihardjono, Jakarta, 22 June 2011.
6 For a historical account of Krakatau Steel, see Moon (2010).
7 "Dari sepuluh satu tercecer," *Tempo*, 18 November 1989.
8 "Mereka yang layak BPIS," *Tempo*, 14 October 1989.
9 "Yang untung yang strategis," *Tempo*, 30 September 1989.
10 See "Foreword" by B.J. Habibie in Badan Pengelola Industri Strategis (1996), pp. 4.
11 Ibid.
12 Ibid.
13 Interview with Giri Suseno Hadihardjono, Jakarta, 22 June 2011.
14 "Mereka yang layak BPIS," *Tempo*, 14 October 1989.
15 B.J. Habibie, "Foreword" in Badin Pengelola Industri Strategis (1996).
16 This argument is put forth in Juoro (1998).
17 "Dari sepuluh satu tercecer," *Tempo*, 18 November 1989.
18 Interview with Giri Suseno Hadihardjono, Jakarta, 22 June 2011.
19 "Dari sepuluh satu tercecer," *Tempo*, 18 November 1989.
20 "Oleh-oleh dari London," *Tempo*, 18 November 1993.
21 Interview with Giri Suseno Hadihardjono, Jakarta, 22 June 2011.

22 Before the Maleo project was fully completed, Tommy Suharto founded a company named Timor Putera Nasional, which aimed to manufacture Korean-produced KIA mid-sized sedans to be labeled Timor. Part of the scheme was that the government exempted Timor from paying import taxes. In 1999, Timor went bankrupt as it failed to repay its debt to the government and the national car never materialized. This is one of the events when Suharto's family interests disrupted Habibie's program of national industry. See "Memburu tunggakan pajak Timor," *Tempo*, 1 February 1999.
23 "Yang untung yang strategis," *Tempo*, 30 September 1989.
24 Singapore's Temasek and Malaysia's Khazanah may appear to have a resemblance to BPIS. Yet, the focus on technological development distinguishes BPIS from these two state-owned holding companies.
25 Badan Pengelola Industri Strategis (1996), p. 5.
26 "Bukan industri mainan," *Tempo*, 10 July 1993.
27 "Akar dan bom waktu," *Tempo*, 9 December 1989.
28 See Thee (1994).
29 "Bank Dunia menembak siapa," *Tempo*, 12 June 1993.
30 "Bank Dunia menembak siapa," *Tempo*, 12 June 1993.
31 "BUMN: di Luar and di dalam BPIS," *Tempo*, 6 January 1990.
32 See an op-ed piece by U. Juoro "Teknolog, teknokrat, dan strategi pembangunan nasional," *Kompas*, 22 March 1996.
33 "Bukan industri mainan," *Tempo*, 10 July 1993.
34 "Bank Dunia menembak siapa," *Tempo*, 12 June 1993.
35 See Kartasasmita (1994).
36 See Amir (2009a).
37 Habibie (1995), pp. 208.
38 Badan Pengelola Industri Strategis (1996), pp. 5.
39 Habibie (1995), p. 208.
40 B.J. Habibie, "Foreword" in Badan Pengelola Industri Strategis (1996), p. 5.

5 Accelerating transformation

1 The brief historical account of aviation in the colonial period here is taken from Said D. Jenie's 2004 paper "Aviation history in the archipelago."
2 This is recounted in Irahali (2003).
3 In 1963, R.J. Salatun was involved in the founding of the National Aeronautics and Aerospace Institute (LAPAN).
4 See Soeparno (2004), pp. 54–5.
5 Soeparno (2004), pp. 120–5.
6 Kepik is a Javanese name of an insect. The name came from Sukarno.
7 Soeparno (2004), pp. 151–5.
8 Soeparno (2004), pp. 156–61.
9 Personal communication with Yuwono, 14 June 2005.
10 Interview with Oetaryo Diran, Jakarta, 28 July 2004.
11 Personal communication with Yuwono. 14 June 2005.
12 Sukarno used the national symbol *Garuda*, a mythical bird, to express the air power of Indonesia.
13 For the story of this small group, see Simanjuntak (1988).
14 For an account of Ibnu Sutowo and his projects, see McDonald (1981).
15 Interview with S. Paramajuda, Jakarta, 2 July 2004.
16 Interview with Ali Wardhana, Jakarta, 29 July 2004.
17 Interview with B.J. Habibie, New York, 6 July 2005.
18 Interview with B.J. Habibie, New York, 6 July 2005.
19 Makka (1996a), pp. 107–8.
20 Interview with B.J. Habibie, New York, 6 July 2005.

21 Personal communication with Yuwono, 1 August 2004.
22 Makka (1996a), p. 108.
23 According to Habibie, this affair started from a personal letter written by Nurtanio's widow dated on 18 February 1985. In the letter, Mrs Nurtanio asked Habibie as president director of IPTN to grant scholarships to her sons for studying abroad (personal communication with Yuwono, 14 June 2004). However, the content of the letter was not the issue. What displeased Habibie was that Mrs Nurtanio had written the letter on paper with IPTN logo-like letterhead (see Soeparno 2004). Habibie felt troubled that Mrs Nurtanio had used such letterhead. Habibie recalled that a few years after the IPTN began to operate, the Air Force Foundation contacted him, demanding 30 percent of IPTN shares be given to Nurtanio's family. Habibie turned down the Air Force, arguing that IPTN was a profit-making company and had no connection with Nurtanio's family. To eradicate Mrs Nurtanio's possible rights of the company shares via use of her husband's name, Habibie decided to alter the corporate name. Less than a year later, Suharto approved the change of the IPTN's name from "Nurtanio" to "Nusantara" through a Presidential Decree No. 5/1986. The deletion of Nurtanio's name drew outrage from the Air Force community. Notwithstanding the president's approval, many of the Air Force believed that the idea came directly from Habibie himself.
24 See Reckoff (1985), p. 244.
25 Habibie (1995), pp. 211–17.
26 Habibie (1995), p. 53.
27 During the first two months, IPTN managed to deliver five helicopters to ABRI. Although the helicopters were designed for civilian purposes, they were used by ABRI in East Timor after Suharto decided to annex this small region as part of Indonesia.
28 Simanjuntak (1988), p. 81.
29 Interview with S. Paramajuda, Jakarta, 2 July 2004.
30 Suharto (1989), p. 452.
31 For a complete statement of the Petition, see Bambang Siswoyo (1983).
32 For an analysis on this affair, see Fatah (2010).
33 "Dalam politik Habibie masih lugu," *Tempo*, Jakarta 26 June 1993.
34 Interview with S. Paramajuda, Jakarta, 2 July 2004.
35 Suharto (1989), p. 452.
36 This observation was drawn from my direct experience working for the Directorate of Technology IPTN from December 1995 to November 1996.
37 Interview with Rahardi Ramelan, Jakarta, 7 July 2003.
38 Based on an unpublished 1997 report by A.T. Kearney.
39 An insider view on this predicament is revealed in Yuwono (2001), p. 46.
40 See Smith and Marx (1994).

6 Take-off

1 "MBB to build Chinese propfan," *Flight International*, 14 June 1986.
2 "ATRA partnership grows," *Flight International*, 13 September 1986.
3 Interview with IPTN staff, Bandung 21 July 2004.
4 "Propfan project on Hold," *Flight International*, 28 May 1988.
5 Interview with B.J. Habibie, New York, 6 July 2005.
6 Interview with S. Paramajuda, Jakarta, 2 July 2004.
7 N stands for Nusantara, 2 for two engines, and 50 for 50 passengers.
8 Interview with Alex Supelli, Bandung 28 June 2004.
9 Ibid.
10 Ibid.
11 "Habibie: ini karya generasi penerus," *Republika*, 10 August 1995.

12 "Ongkos produksi N250 capai 600 juta dollar AS, inventor AS mengincar," *Berita Buana*, 30 June 1994.
13 Interview with Joko Sartono, 1 July 2004. Of this amount, only US$900 million was used before the project was postponed due to the IMF's conditions.
14 Interview with Yusman S. Djamal, Bandung, 31 May 2004.
15 Interview with Hari Laksono, Bandung, 19 June 2004.
16 Interview with Ali Wardhana, Jakarta, 29 July 2004.
17 See for example Ascher (1998).
18 See Walhi document "Gugatan Pembatalan Surat Keputusan Presiden No. 42 Tahun 1994 tertanggal 2 Juni 1994 tentang Bantuan Pinjaman kepada Perusahaan Perseroan (Perseo) PT. Industri Pesawat Terbang Nusantara (PT IPTN)."
19 Interview with Bambang Pamungkas, Jakarta 23 June 2004.
20 Ibid.
21 Ibid.
22 Interview with Said D. Jenie, Bandung, 18 June 2004.
23 "N250 Gatotkoco dipastikan terbang hari ini," *Suara Karya*, 8 August 1995.
24 See Chapter 2 of Breuilly (1994).
25 Partha Chatterjee discusses the separation between the material and the spiritual worlds in the post-colonial society in which the latter is claimed to be the sovereign territory of post-colonial society. See Chatterjee (1993).
26 "IPTN surga bagi para insiyur muda Indonesia," *Gala*, 14 August 1995.
27 From Habibie's speech at the N250 roll-out ceremony.
28 Here freedom is seen as a space that must be filled. Thus, once a nation achieves its independence, its next agenda is to fill the independence with development efforts.
29 "Presiden: Kami yakin kemampuan generasi penerus," *Republika*, 18 August 1995.
30 From Habibie's speech at the N250 roll-out ceremony.
31 See Geertz (1980), p. 102.
32 Geertz (1980), p. 104.
33 Geertz (1980), p. 123.
34 See the discussion on criticism of Geertz in Shweder and Good (2005).
35 "Fasten Your Seatbelt," *Asiaweek*, 11 August 1995.
36 See an op-ed article by Amin Rais, "Ini Keajaiban," *Republika*, 15 August 1995.
37 Interview with S. Paramajuda, Jakarta, 2 July 2004.
38 Interview with Hari Laksono, Bandung, 19 June 2004.
39 Phone interview with Boris Laschka, 18 February, 2010.
40 Interview with Laksono, Bandung, 19 June 2004.
41 "Insya Allah Gatotkoco sukses terbang hari ini," *Suara Merdeka*, 10 August 1995.
42 "Presiden: Dana APBN tak akan digunakan untuk pembuatan N2130," *Pikiran Rakyat*, 12 August 1995.
43 "Airbus Industries congratulates IPTN on N250 first flight," *Indonesia Times*, 15 August 1995.
44 "N250 Naik, Fokker Turun," *Jawa Pos*, 4 September 1995.
45 Interview with Yusman S. Djamal, Bandung, 31 May 2004.
46 "Ini Keajaiban," *Republika*, 15 August 1995.
47 "Sukses N250 bukti IPTN bukan proyek mercusuar," *Media Indonesia*, 11 August 1995.
48 Taufiq Kiemas is husband of Megawati Sukarnoputri, the oldest daughter of Sukarno who was an elected chair of PDI.
49 "Alhamdulilah," *Republika*, 11 August 1995.
50 A strong association of Habibie with ICMI prompted Persis to put forth such a proposal as Habibie was seen as representing the Muslim community. See "Menristek diusulkan terima Bintang Maha Putera," *Pikiran Rakyat*, 12 August 1995.
51 "Habibie: Ini karya generasi penerus," *Republika*, 10 August 1995.
52 "Muktamar XI berakhir: Persis usulkan 10 Agustus Hari Teknologi," *Republika*, 23 August 1995.

53 "PII usulkan 10 Agustus Hari Kebangkitan Teknologi," *Republika*, 8 September 1995.
54 "Kebangkitan Nasional II," *Bisnis Indonesia*, 11 August 1995.
55 "Alhamdulilah," *Republika*, 11 August 1995.
56 "Telah terjual 188 N250," *Angkasa*, 3 December 1994.
57 "IPTN plans for a US market," *Aerospace Asia Pacific*, 10 December 1994.
58 "Gubernur Kansas: Pesawat N250 akan menguasai pasar global," *Republika*, 28 May 1994.
59 See Peacock, Jones, and Brooks (2005).
60 "N250 terobos pasar AS dan Eropa," *Republika*, 14 June 1995.
61 "Biaya pembuatan N2130 tidak menggunakan APBN," *Terbit*, 12 August 1995.
62 Interview with Ilham Habibie, Jakarta, 22 December 2009.
63 Interview with Alex Supelli, Bandung, 28 June 2004.
64 Interview with Ilham Habibie, Jakarta, 22 December 2009.
65 "N2130 tanpa dana APBN," *Jawa Pos*, 11 August 1995.
66 See Mursjid (1998), pp. 221–33.
67 "Biaya pembuatan N2130 tidak menggunakan APBN," *Terbit*, 12 August 1995.
68 See Geertz (1983) "Local knowledge: fact and law in comparative perspective," pp. 167–234.
69 Interview with former vice-chair of BPIS Giri Suseno, Jakarta, 8 June 2004.
70 Many indeed had no objection to participating. But the fact that a group of poorly paid schoolteachers were charged DSTP shares in their monthly salaries without their consent appeared rather unfair. See interview with Indonesian Teacher Union President Basyuni Suriamiharja, *Tempo Online*, 2–24 September 1997.

7 Downfall

1 World Bank (1994).
2 In 1996, Megawati Sukarnoputri, daughter of Sukarno, ascended to the leadership of the PDI and wished to challenge Suharto in the next presidential election. PDI instantly gained popularity among the grassroots and pro-democracy groups. In July 1996, the New Order decided to intervene in the party by supporting another leading figure in the PDI, Soerjadi, to topple Megawati. Having the military's support, the Soerjadi group coercively seized the central secretariat of PDI, resulting in a bloody conflict between the two groups. Dozens of people were killed and many others went missing. Some analysts said that the incident was a precursor of massive protests against Suharto's regime two years later. After being ousted, the Megawati group formed a new party named Partai Demokrasi Indonesia Perjuangan (PDIP) that won the 1999 elections. For a complete account of this affair, see a publication by Institut Studi Arus Informasi and Aliansi Jurnalis Indonesia entitled *Peristiwa 27 Juli* (1997).
3 See the debate on the crisis in "Tahun 1997: Mimpi Buruk Yang Akan Berlanjut," *Tempo Online*, 25 December 1997, available at www.tempo.co.id/ang/min/02/43/utama.htm (last accessed 22 February 2012).
4 Suharto's decision to appoint Habibie as his vice president in March 1998 drew protests from numerous political groups, most notably the military elite and economic technocrats. A few weeks prior to the election, Emil Salim of the economists' group gathered supporters to nominate himself as vice president for Suharto's eighth term. His plans failed as Suharto felt that his engineer technocrat was deserving of the position instead.
5 LOI of the Government of Indonesia to IMF dated 31 October 1997. Available at www.imf.org/external/np/loi/103197.htm (last accessed 20 February 2012).
6 For an account of how these events unfolded, see Aspinall, van Klinken, and. Feith (1999).

7 On this issue, see the account of the former governor of Bank of Indonesia S. Djiwandono (2005).
8 See for example Linnan (1999). See also Hill (2000), "Postscript on the Crisis."
9 See for example Cole and Slade (1998).
10 This view is offered in Winters (1999).
11 Interview with Emil Salim, Jakarta, 14 December 2010. See also Culp, Hanke, and Miller (1999); Risenhuber (2001). Another strong criticism came from former Minister of Economy Rizal Ramli in his unpublished essay "The IMF's Indonesian myths," available at www.ideaswebsite.org/featart/may2002/IMF_Myths.pdf (accessed 20 February 2012).
12 LOI of the Government of Indonesia to IMF dated 15 January 1998. Available at www.imf.org/external/np/loi/011598.htm (accessed 22 February 2012).
13 In addition to IPTN, the government also announced the plan to terminate all special tax, customs, or credit privileges granted to the National Car project, which was initiated and controlled by Suharto's son, Hutomo Mandala Putera.
14 This information came from an economist and a former student of Widjojo Nitisastro who refused to disclose his name.
15 When Suharto was about to meet Michael Camdessus to discuss the LOI, he had requested that the IMF not intervene in IPTN. To his surprise, the IMF had already planned to cut all subsidies for IPTN. After the meeting, Suharto looked very upset and disappointed. Interview with Hadi Soesastro, Jakarta, 12 July 2004.
16 For an account of the negotiation between Suharto and the IMF in regard to subsidies for IPTN, see Risenhuber (2001).
17 Interview with Umar Juoro, Jakarta, 23 July 2004.
18 Coordinated through the BLBI scheme, the bailout resulted in a large-scale scandal implicating several employees of the Bank of Indonesia. A number of bank owners fled the country with the loans they received from the scheme.
19 Interview with Rahardi Ramelan, Jakarta, 27 June 2011.
20 Interview with Dawam Rahardjo, Jakarta, 25 July 2003.
21 "Mahasiswa menuntut parlemen menentukan," *Tempo*, 3 November 1998.
22 In his biography, Habibie recounted that the commander of Army Special Forces General Prabowo had plotted a coup against him. See Habibie (2006).
23 For a complete account on this process, see Singh (2000).
24 For an account of how this process unfolded, see Downer (2005).
25 Due to the IMF LOI, all government funding to IPTN was converted into a government loan that IPTN was obliged to repay.
26 Interview with Yusman S. Djamal, *empo*, 21–27 July 2003.
27 See Peraturan Pemerintah Republik Indonesia No. 52 Tahun 2002.
28 Interview with Giri Suseno Hadihardjono, Jakarta, 22 June 2011.
29 When Abdurrahman Wahid became president in 1999, he appointed political scientist A.S. Hikam as Minister of Research and Technology as a means to accommodate the interests of the Nation Awakening Party (PKB) to which Hikam was affiliated.

Epilogue

1 For a collection of studies on technology and politics, see Allen and Hecht (2001).

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